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SHOP TEACHERS

Welcome back to your school shops. May the enjoyment experienced during your vacation be exceeded by the pleasure which you will get out of your work during the coming school year.

THE MARK OF QUALITY

Not all products which are sold to schools bear the mark of quality.

There will necessarily be high-priced, medium-priced, and low-priced products offered for school consumption, and the advertising pages of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine carry the story of each of these three types of products. This is because the publishers of that magazine recognize the need and place of each of them.

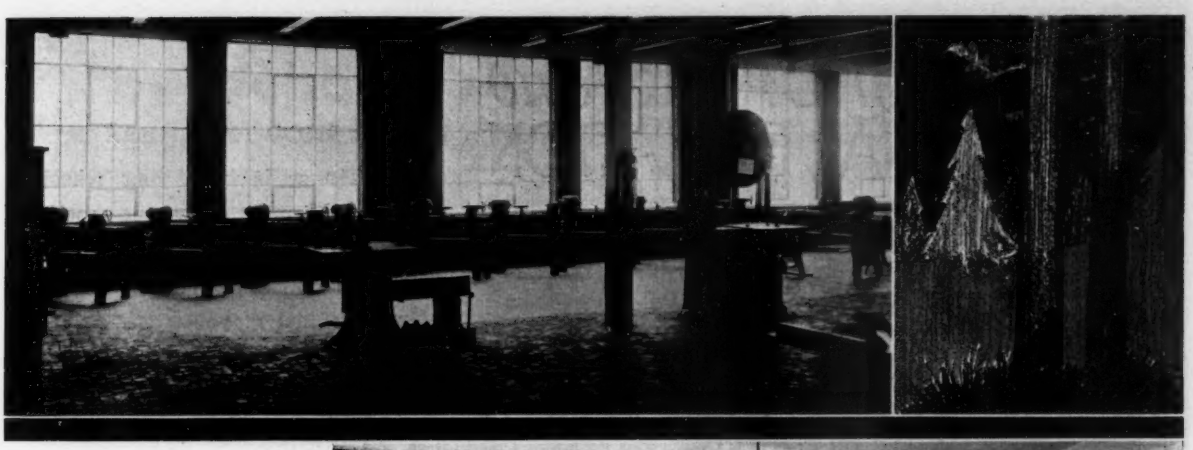
However, even the lowest-priced product must have a definite school use before it is accepted for purposes of advertisement.

In other words, every article advertised in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION bears the mark of quality. Its acceptance by that magazine is a proof of its acceptability for school use.

THIS MONTH'S COVER

The picture on the cover shows students of the bricklaying class of the Frank Wiggins Trade School, Los Angeles, California.

Photo by Wide World Photos, New York City.



One of the LEADING SCHOOLS *in* CANADA *Selects* YATES-AMERICAN EQUIPMENT

Another well-known school has chosen Yates-American as exclusive equipment for its woodworking department. The Westdale Secondary School, Hamilton, Ontario, can boast of one of the most modern installations in all Canada. The machines include ten No. 12 Speed Lathes, a B-4 Single Surfacer, a No. 1 Variety Saw, a Y-30 Band Saw, a No. 1 12" and B-11 4" Planer, a No. 51 Swing Saw, a Pedestal Grinder, a No. 5241 Jig Saw, an N-4 Shaper and a K-25 Mortiser, all direct motor driven, operating on 60 cycles.

Yearly, the list of schools standardizing on Yates-American equipment increases. The reason lies in the extra service this equipment renders, its dependability and ease of operation. Finally, the student trained with Yates-American machines is trained with machines used generally in wood plants throughout the world.

YATES-AMERICAN MACHINE CO.

BELOIT, WISCONSIN

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

Volume 20 SEPTEMBER, 1931 Number 9

Shop Class Management

*Carl J. Orness**

THIS is the method of shop class management that has been used in the auto shop at Lincoln High School, Lincoln, Nebraska, during the past two years. This plan gives the instructor an opportunity to devote most of his time to teaching and less to the keeping of records. It also provides for a maximum of student participation and throws much responsibility on the shoulders of the students.

Types of Classes

Before going into detail, the present situation at Lincoln High School is given to show how this plan is used for both general educational and trade-preparatory students. There are two types of classes, one known as the industrial-arts class which is general educational in nature, with 60-minute periods, and a maximum of 24 members in each class. Three morning periods are devoted to this work. The other type is known as the technical class. Its members spend three hours daily in the shop doing trade-preparatory work. The maximum enrollment is twenty with an average of about fifteen. The afternoon is devoted to this work, and the course continues for two years.

Type of Shopwork

All shopwork for both types of classes is on a production basis. There are no so-called dead units. The school furnishes four or five cars yearly which are thoroughly overhauled and rebuilt. This provides a means of governing the type of work done by each student. Depending on production jobs only, would leave out some work, such as clutch replacing and transmission overhauling, that would not be covered in the training of the student, unless some means of providing this work is sure to come into the shop. This we do on the cars that we rebuild for the school.

Classroom

The classroom is divided into two parts, a balcony and the shop proper. On the balcony are 24 seats and some bookcases. It is the place set aside for study and class meetings. The main shop floor has a space for 20 cars, a washroom in which are the lockers, a toolroom, and a paintroom. Stalls are marked on the floor with black paint in order that cars may be kept in their places. The balcony arrangement is not especially desirable. It causes a great deal of running up and down stairs for reference and study materials. This is particularly tiring to the instructor who has to make at least ten trips every day to take care of his class meetings. As a place for study it is not so good either, because anyone on the balcony can see everything that is taking place on the shop floor and this draws the attention of the student away from his work. This is particularly noticeable when it becomes necessary for a few boys to go to the balcony and do some reference work and study in connection with their job.

Shop Equipment

There are four benches, each 9 ft. by 36 in., on which vises, piston clamps, drill stands, and other bench equipment is mounted. Each bench has four 30 by 30 by 8-in. drawers, and two 30 by 48 by 8-in. trays. The trays are mounted on casters so that large parts can be put into these and rolled back and forth from the job to the bench. All of the drawers and trays are numbered with a corresponding number for their place in the benches. They are also equipped with hasps and padlocks so that all parts may be put away and locked up at the end of the period.

Five tool trucks are used, on which 25 commonly required hand tools are mounted. These trucks are painted black with outlines of the tools in the same color as the tools are painted. Each truck has a different color scheme to prevent interchanging of tools by the student in case any are mislaid. This truck is described in detail on page 354, September, 1927, issue of the INDUSTRIAL-ARTS MAGAZINE. The only change made since that date is in the color scheme previously mentioned. These trucks are lettered A, B, C, D, and E, and each class is divided into groups having the same letters. This designates the truck which each group is to use.

*Instructor Auto Mechanics, Lincoln High School, Lincoln, Nebraska.

Additional special tools are placed on racks or in drawers in the toolroom. The handles of all tools in the toolroom are painted black to prevent interchanging with those on the tool trucks. The method of checking out tools will be described later.

In addition to this, we have general auto-shop equipment, such as:

Hoist	Rear-axle stand
Jacks	Air compressor
Horses and blocks	Lathe
Welding outfits	Valve-refacing machine
Arbor press	Forge
Drill stand	Piston aligner
Vises and piston clamps	Grinder
Engine stands	Buffer

Shop Forms

Form 1. Shop Guide: This is given to, read by, and discussed with the students at the beginning of the semester. Then it is posted on the bulletin board. It contains the general rules for the shop under which all work.

Form 2. Grades: This is given to each student at the beginning of the semester to keep in his notebook and it is also posted on the bulletin board.

Form 3. Group Arrangement: Each class is divided into five groups, A, B, C, D, and E, with a foreman at the head of each group, one shop manager, one toolroom keeper for the technical class, and two toolroom keepers for the industrial-art classes. The groups change every week in the industrial-arts classes and every two weeks or more, depending on the work, in the technical classes. Every student some time during the semester is shop manager, toolroom keeper and several times a foreman. The scheme of making group changes every week is illustrated in Form 3.

AUTO SHOP — LINCOLN HIGH SCHOOL

SHOP GUIDE

Every shop has rules or regulations that must be followed by each individual in it. Visitors, customers, and persons passing the shop door will judge the shop by what they see at the moment. A desirable shop atmosphere and appearance should prevail at all times. These items should be constantly watched by all members in the class.

Clothing — wear suitable, clean shop clothes.
Floor — absorb grease, oil, or water with sawdust and sweep clean.
Rags — place dirty and greasy rags in metal container.
Lights — turn off when not needed.
Washroom — place used towels in receptacle.
Cars — place cars squarely in the stalls.
Equipment — keep it in its place when not in use.
Drain Pans — keep in place provided.
Horses and Blocks — stack neatly in their places.
Benches — keep bench sides and tops clean.
Parts — place parts in drawers and lock at end of period.
Tools and Trucks — wipe off all tools and check in clean.
Clean up — do the assigned duties before washing and changing clothes.
Breakage — report immediately to the instructor any breakage of tools or parts.
Running Engines — hook up to exhaust connections.
Job Cards — foremen fill in proper spaces at end of every period.
Record Cards — fill in daily; be sure you have the correct job number.
Lockers — use the assigned lockers only. Lockers will be opened by the toolkeeper at the beginning of the period. If you wish to lock locker during the period, obtain the key from the toolroom.
Shop Doors — keep the shop doors closed. When you bring in cars be sure to have someone open the doors for you, so that they will not be left open longer than is necessary. Do not honk horn in driveway. Drive in slowly and carefully without racing the engine so that the noise will not interfere with classes in other rooms.
Upholstering — use shop seat covers to protect upholstering in cars.
Fingerprints — be careful and do not leave greasy fingerprints on cars, cards, tools, benches, desks, and equipment.

FORM 1. ORIGINAL SIZE 5¼ BY 8 IN.

AUTO SHOP — LINCOLN HIGH SCHOOL

GRADES

Grades are based on two considerations:
Fifty per cent on the quality and amount of work.
Fifty per cent on attitude, application, coöperation, assuming responsibility, dependability, working with others and other personal traits.

Tests and Examinations:
These are checked and graded on a comparison plan. Any mark that you receive on a test will indicate your position compared to others in the classes taking the same work. The papers are first scored for the number of correct answers. The scores on all of the papers are added and the total is divided by the number of papers, thereby setting up an average score. Using this as a guide, the marks are distributed to indicate whether your paper is above, below, or with the average.

Misdemeanor:
This term is used to indicate undesirable traits that appear through carelessness, negligence, poor application, lack of attention, daydreaming, loafing, and other disturbing acts.

Red ink on record cards:
This mark calls to your attention a misdemeanor. You are given two weeks from the date of the offense to make suitable arrangements and correct or make up for your error. Two such marks not properly taken care of before a report period will lower a grade to *fail*.

Correction of Misdemeanors:
These are suggested methods for correcting some errors.
Unexcused absence — made up in actual shop time after school.
Unpreparedness — not having proper shop clothing. Handled same as "unexcused absence."
Repeated Tardiness — handled same as "unexcused absence."
Disturbance — any disturbance caused in the class will be handled the same as "unexcused absence" and the grades will also suffer.
Skipping — handled same as "disturbance" with time doubled.
Noise — handled same as "disturbance." This includes shouting, loud talking, whistling, and playing around.

Desirable Traits:
Sincere effort, courteous consideration for others, neat personal appearance, cleanliness on the job, accuracy in all work, careful use of tools and machinery, working together, thorough application, and so forth, are traits worth developing in any type of work.

FORM 2. ORIGINAL SIZE 5¼ BY 8 IN.

I. A. - 30 - 100

AUTO SHOP LINCOLN HIGH SCHOOL

GROUP ARRANGEMENT CHART

Groups change every week, usually on Mondays.

Key letters: TR—Toolroom keeper. FA, FB—Foremen
SM—Shop Manager. A, B, C,—Members of groups

Name	Date / Locker No.	Sept. 17	Sept. 24	Oct. 1	Oct. 8
Alderson	14	TR	E	FE	D
Anderson	14	TR	TR	E	FE
Arens	15	SM	TR	TR	E
Baker	15	FA	SM	TR	TR
Bartell	16	A	FA	SM	TR
Borris	16	A	A	FA	SM
Brunzell	17	FB	A	A	FA
Carlson	17	B	FB	A	A
Carpenter	18	B	B	FB	A
Dalgren	18	FC	B	B	FB
Hegg	19	C	FC	B	B
Johnson	19	C	C	FC	B
Marcotte	20	FD	C	C	FC
Nordquist	20	D	FD	C	C
Peterson	21	D	D	FD	C
Roleth	21	FE	D	D	FD
Schmidt	22	E	FE	D	D

FORM 3. ORIGINAL SIZE 5¼ BY 8 IN.

I. A. 32-270

Auto Shop Lincoln High School

TIME PASS SHEET

If you wish to leave the room during the class period, follow these instructions.
Look at this sheet to see if anyone is out.
Write your name & time you leave in OUT space.
When you return fill in time in IN space.
REMEMBER.....only one person out at one time.
Five minutes is time limit.
No one shall leave the room during the last fifteen minutes of the first, second and third periods, and the last thirty minutes of the afternoon period. Leaving the room every day at the same time should be avoided.

Name	Out	In	Name	Out	In

FORM 6. ORIGINAL SIZE 5¼ BY 8 IN.

FORM 7
TOOL CHECK
ORIGINAL SIZE
2 BY 3 IN.

Shop No. .....
Name .....
Tool .....
.....
.....
.....
O.K. .....

AUTO SHOP LINCOLN HIGH SCHOOL

DUTIES

This suggests the duties for each member in the class:

Toolkeeper:
- Unlock lockers.
- Check trucks and racks for missing tools.
- Watch tool checks for proper signature.
- Fill towel racks.
- Admit no one inside of toolroom.
- Keep toolroom clean and in order.
- Check in all tools.
- Report tools not returned.
- Report foreman who does not clean tools before returning them.
- Lock toolroom and lockers.
- Hand in report.

Foreman:
- Check out tools and trucks.
- Keep your group together.
- Do not allow others outside of your group the use of any tool you have checked out unless you know where it is and who will pay for it, if lost.
- See that tools are clean before checking them in.
- Lock parts drawers at end of period.
- Fill in job card; indicate the work finished.

Shop Manager:
- Take care of absence slips.
- O.K. and sign tool checks.
- See that every job has a job card.
- Take care of parts-drawer chart.
- Keep shop equipment in order.
- Keep shop doors closed.
- See that operating engines are hooked up to exhaust connections.
- Do special assigned jobs.
- Check toolkeeper's report for missing tools.
- At end of period, see that bench drawers are locked, clean-up jobs finished, job cards are properly filled in, and that shop equipment is in its place.
- Hand in report.

Other Members of Groups:
- Work with others in group on assigned job.
- Help keep all tools clean.
- Take care of parts and equipment at the end of the period.

All Class Members:
- Know definitely what to do before you start on any assignment. In shopwork, you may undo in a few minutes a job that will take hours to repair.

FORM 4. ORIGINAL SIZE 5¼ BY 8 IN.

Form 4. Duties: This is carefully explained and discussed with the student before doing any shopwork. It is then posted on the bulletin board for future reference. This outlines the duties of each individual in the organization.

Form 5. Toolkeeper's Daily Report: This report can be completely filled in in less than three minutes, so it does not become a burdensome task for the toolkeeper. It provides an extra check on our tool-checking system and often locates the individual who is careless in handling shop tools. These forms are gone over by the shop manager every day to check any dis-

crepancy made by the toolroom keeper. It provides an effective check on the toolkeeper, because there is a report of the one who left the toolroom, the period before, and the report of the one who takes care of the toolroom after this individual.

Form 6. Pass Sheet: In using this sheet the student does not need to ask permission from the instructor to leave the classroom (see form for details).

Form 7. Tool Check: Made out by the foreman of each group. In place of shop number, we use the letter for the group and the period of the day, as A-1, B-1, or A-2, B-2, etc. Then the name of the foreman and the description of the tool. This is O.K'd by the shop manager. One tool only can be checked out on one check with the exception of a tool truck. The toolkeeper hangs this check on the place where the tool belongs. At the end of the period when the tool is returned the check is given back to the foreman and he destroys it. If the tool is not returned, the toolkeeper hands the check to the instructor so that proper charges can be made against the foreman. The signature of the foreman on the toolcheck prevents others from drawing out tools and trying to claim that the foreman checked them out, as sometimes happens when a number system is used.

Form 8. Group Job: This is made out by the instructor at the beginning of the period. He indicates the part of a job the group is to do that period. This form is placed on a spindle so that the student can refer to it if he does not clearly understand the assignment. There is a spindle for each period. From day to day the same group is assigned the same job, doing various operations within that job, which helps them to follow the job from start to finish. The slips for a semester are kept on these spindles. This aids the instructor to vary the type of work for each group during that time.

Form 9. Job Card: (Front Side): When a job enters the shop, a job card is made out by the shop manager or the instructor. The shop manager indicates the number of parts drawer, and places the card in a holder provided for that purpose, and hangs it on the front of the car. Any material or parts used on a job are indicated on this card. These cards are kept in a card file as a permanent shop record.

Form 9. Job Card: (Reverse Side): At the end of the period the foreman fills in the work completed by his group. From this notation the group following can determine where to start and carry on with the job. This serves two purposes — it gives the student opportunity to use trade terms and helps the instructor in making his plans for the groups. An actual example of this is shown in *Form 9A.*

Form 10. Parts Drawer: This chart is kept by the shop manager. When a job comes into the shop he refers to the chart for an empty drawer in which to place the parts. The drawer number is indicated in the space provided on the job card. In the space provided on the chart he indicates with the letter "F" that this particular drawer is in use. When the job is finished he again refers to the chart and indicates by the letter "E" that the drawer is empty.

AUTO SHOP — LINCOLN HIGH SCHOOL

TOOLKEEPER'S DAILY REPORT

Date..... Period..... Toolkeeper.....

Fill in report completely, hand in at end of period. Use a check mark (V) for YES and a question mark (?) for NO in questions 1, 3, 5, 6, and 8.

Beginning of Period:

1. Are all tools on truck? A....B....C....D....
2. Tools missing on trucks (name of tool and truck). .....
3. Are all tools in racks? ....
4. Tools missing in racks..... .....

End of Period

5. Are all tools on trucks? A....B....C....D....E....
6. Were all tools returned? ....
7. Name of tool and foreman who checked out tool and failed to return it..... .....
8. Have you completed your duties? Doors locked? .... Lockers locked? .... Lights turned out? .... Keys in? .... Toolroom floor swept? .... Used tool checks discarded? .... Tool racks cleaned and in order? .... Oil cans filled? .... Extension lights in working order?

FORM 5. ORIGINAL SIZE 5¼ BY 8 IN.

AUTO SHOP — LINCOLN HIGH SCHOOL

SHOP MANAGER'S DAILY REPORT

Date..... Period..... Name.....

Fill in report completely, hand in at end of period. Use check mark (V) for YES and question mark(?) for NO.

1. Are absence slips placed in holder?.....
2. Did you bring down spindle and group chart?.....
3. Is there a job card for each group assignment?.....
4. Is general appearance of shop in order?.....
5. Is oil, grease, or water on floor covered with sawdust? .....
6. Is hand-cleaning basin filled with cleaner?.....
7. Is parts-drawer chart up to date?.....
8. Have you checked toolkeeper's report?.....
9. Did you locate missing tools?.....Where?..... .....Last group to work on this job.....
10. Are all job cards posted?.....Statements?..... Cards filed? .....
11. Do we need any supplies for any job?..... .....
12. Have you completed your special duties?.....
13. Is there work unfinished that should be continued by the shop manager next period?.....Explain..... .....

End of Period:

14. Are job cards properly filled in by the foremen?..... Shop equipment in place?.....Parts drawers locked? .....Washroom in order?.....Doors closed?..... Spindle and group chart upstairs.....

FORM 5-A. ORIGINAL SIZE 5¼ BY 8 IN.

AUTO SHOP LINCOLN HIGH SCHOOL

GROUP JOB

Date..... Period.....

A. Car ..... D. Car .....
Job ..... Job .....
B. Car ..... E. Car .....
Job ..... Job .....
C. Car .....
Job .....

FORM 8. ORIGINAL SIZE 3 BY 4 IN.

DEPARTMENT OF INDUSTRIAL ARTS, LINCOLN HIGH SCHOOL AUTO SHOP

Car owner..... Car..... Job No.....
Address..... Phone..... License.....
Date..... Speedo reading..... Parts.....

Description of Work	Parts & Material		
	Total		

Reverse side (Work side)

Work Finished
Group
Period
Date

FORM 9. FRONT AND REVERSE SIDES. ORIGINAL SIZE 6 BY 4 IN.

DEPARTMENT OF INDUSTRIAL ARTS, LINCOLN HIGH SCHOOL AUTO SHOP

Car owner Bailey, Leslie Car Ford coupe Job No. 974
Address 1st Period class Phone License 2-17228
Date 12-16-31 Speedo reading Parts 16

Description of Work	Parts & Material		
Remove battery for recharge	35	Bank Linings	1 00
Reline transm. bands	60	Gaskets	35
	95		1 35
			95
			2 30
		Paid 12/16/31	
		Total	

Reverse side (Work side)

FORM 9-A.

I.A. 27-2000

Daily Record Card — High School Auto Shop

Name Course Semester Period

Job
Car
Job No.
Date

FORM 11. PRINTING ON FRONT AND REVERSE SIDES IS ALIKE. ORIGINAL SIZE 6 BY 4 IN.

I.A. 31

Auto Shop — Lincoln High School

FARTS DRAWER CHART

Key: E-empty, F-full or in use, L-3, L-6—large trays

Drawer Number
Date Checked by

FORM 10. ORIGINAL SIZE 5½ BY 8 IN.

LINCOLN HIGH SCHOOL
Department of Industrial Arts

AUTO SHOP

Lincoln, Nebr.

Date

Shop Job No.

Statement made out by

We Appreciate Your Patronage

FORM 12. ORIGINAL SIZE 5½ BY 8 IN.

AUTO SHOP — LINCOLN HIGH SCHOOL

TYPICAL CLASS PERIOD

Class meets on balcony, each member takes assigned seat.
Roll call, checked by the vacant seats.
Announcements.
Shop manager takes care of absence slips.
Groups are assigned jobs.
Toolkeeper unlocks lockers.
Members change clothes.
Foremen check out trucks and tools.
Groups work on their jobs.
Shop manager checks toolkeeper's report for last period.
Shop manager announces time to clean up.
Foremen check in tools.
Members of groups put away equipment and parts.
Members do assigned clean-up jobs.
Everyone washes and changes clothes.
Toolkeeper locks lockers.
Foremen fill out reverse sides of job cards.
Members fill in their record cards.
Shop manager makes general check-up on shop condition.
Toolkeeper hands in daily report.
Class is dismissed.

FORM 13. ORIGINAL SIZE 5¼ BY 8 IN.

AUTO SHOP — LINCOLN HIGH SCHOOL

SELF-IMPROVEMENT

A letter on your record card indicates the impression you are making.

A. Loud talking — can be heard above others in the shop.
B. Wandering around — not staying on the assigned job.
C. Standing around — not working, hands in pockets, etc.
D. Lost — do not know the group you are in or assigned job.
E. Curious — try all horns, move shifting levers, etc., on cars.
F. Careless — leave tools dirty; finger marks on cars and cards.
G. Loafing — stand around when job is finished; do not ask for another.
Loafing on the job — stand around, let others in group do the work.
I. Not interested — do not seem to be interested in the work.
J. Visiting — with others instead of working on the job.
K. Headstrong — want to do things your own way without asking advice of instructor.
L. Poor application — not applying yourself as well as you could.
M. Helpless — do not seem to know what to do next on the job.
N. Speedy — want to rush through job and sacrifice good workmanship.
O. Joy riding — going out with others that are assigned to take car out, without permission.
P. Day dreamer — killing time in various ways and not trying to work.
Q. Listless — do not seem to care whether you turn out any work.

FORM 14. ORIGINAL SIZE 5¼ BY 8 IN.

Form 11. Daily Record Card: Each student is given one of these cards on which he makes an entry for every day. The instructor has in his file a similar card which is posted once a week by the student from his own individual card thereby relieving the instructor of the time necessary to post individual records for all of the students. This posting by the class on the instructor's set of cards does not consume more than four minutes of time once a week. The only posting on the card by the instructor is made in red ink to indicate any difficulty the student has caused at any time. The following posting day the student will see the trouble he has caused. Two such red-ink marks not properly corrected before the end of the marking period will lower the grade to a failure. The student will see this red-ink memorandum once every week from then on and will be constantly reminded of the difficulty he once had. To correct such a mark the student can refer to his copy of Form 2, under misdemeanors, and find out what he has to do.

Form 12. Auto-Shop Statement: Made out by the shop manager, foreman, or student when a job is completed, a carbon copy of which is kept on file.

Form 13. Typical Class Period: This outlines the procedure followed by each class. A copy of this is given to each student and thoroughly explained at the beginning of the semester so each individual will know where be belongs and his particular task.

Form 14. Self-Improvement: This form is posted on the bulletin board. From time to time the instructor or shop manager will indicate on the instructor's set of daily record cards by a letter A, B, C, D, etc., the impression the student is making. This will call to the student's attention how he compares with other students and suggests actions that should be corrected.

General Comments

This system of organization:

1. Gives the student a great deal of responsibility.
2. Teaches methods of filing and recordkeeping of individual work and classwork.
3. Gives the student a chance to participate in the business management of the shop organization.
4. Relieves the instructor of much detailed recordkeeping and allows more time for individual help. Some students become quite "puffed up" when they are shop managers. This quickly disappears, however, when they again become mere members of a group.
5. Improves the morale. The student knows at the beginning of the term what will happen if he does not do his part.
6. Reduces disciplinary cases to a minimum.
7. Uses job cards and checking system in the school shop that are similar to those used in industry.
8. Increases student participation in the management of the classroom.
9. Through the weekly rotation of duties puts all students on the same level as coworkers and eliminates the dominating feeling developed by some upper classmen when they alone are given authority over others.
10. Is readily adapted to any type of shopwork and any size of class enrollment.

International Drawing Exchange

*Walter G. Hjertstedt**

PERHAPS no activity has had a more diversified or widespread influence upon the progress of the human race than the mutual interchange of ideas. In its earlier stages, interchange found a limited expression in barter among primitive peoples. This developed into trade and the opening of trade routes, widening its scope into the commerce of nations and diplomacy of governments. From the branching out of these activities grew the guilds of master craftsmen whose industry and skill covered the medieval world with architectural beauty and filled its galleries with priceless works of art. All the inventions of the modern world, its comforts and luxuries, its friendly relations, its mutual understandings, are the outgrowth of an ever-increasing exchange, binding together individuals and nations in a fellowship of general helpfulness, appreciation and good will.

Modern inventions which have brought into close relation widely separated peoples have faced mankind with new situations. Though geographic and political divisions will continue, God and man have linked the nations together and no nation can be indifferent to any other nation. People everywhere are thinking internationally but there still exists a strong feeling of nationalism which makes one people suspicious of another. Present-day requirements make internationalism imperative and it is the task of the school to break down these national barriers.

Nations and civilizations differ in manners of life, in modes of thought and of expression, yet there are some elements in which the thoughts of all people are akin, at least in the abstract. One of them is art. Art speaks in a common language. Art holds a common appeal for all the world, whether it be a pastoral, or a statue, or a house, or a machine, delineated by brush, pen, pencil, or chisel.

As we are brought more and more in touch with each other, with a common ground of interest, there is less occasion for misunderstandings, and a stronger disposition — when we have differences — to adjust them peacefully. Boys do not make war. Men make war. When a boy in one nation has a warm friend in another nation, his tendency will be to judge all of that nation by the high standard set by his friend. Men are merely boys of an older growth. Probably through International Drawing Exchange which originated at the Roosevelt Senior High School, Chicago, several years ago, many boys in many nations will have established friendships in other nations which will endure into manhood and exert their benevolent influence.

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"Whoever controls the mind of youth determines war or peace."

Objectives

Early in March, 1928, the Roosevelt Senior High School conceived the idea of exchanging drawings of a mechanical or architectural nature with the students of secondary schools or their equivalent in other nations of the world. "Science and art belong to the whole world and before them vanish the barriers of nationality." — *Goethe.*

The first task was to establish the following objectives

1. To exchange drawings and obtain new ideas in architecture and engineering from foreign countries.
2. To establish a permanent exhibit of the work of student architects and engineers in foreign countries.
3. To give those who are interested in architecture as a means of livelihood, an accurate knowledge of the architecture of other lands.
4. To bring about international understanding and good will through education and the medium of the school, and to develop toward the people of other countries a spirit of tolerance and friendly coöperation.
5. To exert a direct influence upon the educational projects of the Chicago World's Fair in 1933.
6. To create international friendly rivalry which is the spur to industrial improvement, the aspiration to useful invention, and to high endeavor in human activity.
7. To give for the sake of giving, and to accept and assimilate ideas from all over the world.
8. To learn of the accomplishments and difficulties of students in other countries.
9. To achieve unity between the nations of the world which may lay the foundations for a universal era of peace and good will between the nations of the earth.
10. To exert a direct influence upon the established policy of coöperation between the United States and other countries.
11. To bring about a world-wide exchange of ideas and designs for the betterment of architecture and mechanical designing.
12. To inject a spirit of romanticism into the every-day routine of the schoolwork, and provide an educational diversion for the students.

It is hoped that we may be moved to a higher and nobler effort for our own and the world's good, and that out of the International Drawing Exchange may come relations of mutual respect, confidence, and friendship that will deepen and endure.

Coöperation of Consuls

While the statement of objectives was in course of preparation, we obtained from the state department at Washington, an official list of American consuls and ambassadors in foreign countries. Then to the four corners of the earth went forth letters to American consuls, each signed by a student of Roosevelt High, asking for their coöperation in an international drawing exchange. Some of the first replies were from

consuls, directing further correspondence to some educational official or instructor, but many replies came directly from the foreign educators themselves. We are greatly indebted to the courtesy of the American consuls who have coöperated very cordially in placing the students of Roosevelt High in contact with appropriate schools in their respective localities. These contacts continue to grow. Our school has been in direct communication with government officials, and others, in practically all the countries of the world.

Letters showing the growth of our plan of educational coöperation between the nations of the world have been filtering in from France, Germany, Mexico, Irak, Siam, Spain, Brazil, Norway, Sweden, Denmark, Lithuania, Dansig, Hungary, Belgium, Liberia, and other nations, showing a willingness to coöperate. The students received letters of commendation from the Acting Governor of Hawaii, the German Minister of Business and Commerce, and other notables.

A letter from the State Secretary of Schools in Bern, Switzerland, mentions that he is very much interested in the exchange and wishes the schools of Switzerland to coöperate.

From the State Civil College in Monterey, Mexico, comes a promise to send plans and details of architecture typical of that region.

Rosario, Argentina, sends a reply to the effect that in the near future direct communications from the students of the Rosario Consular District will be received. The leading newspaper in Rosario, *La Capital*, contained an extensive account of the International Drawing Exchange in their issue of June 7, 1930.

A letter from the J. J. School of Art, Bombay, India, reads in part as follows:

"We quite appreciate your suggestion of exchanging architectural drawings and ideas and we are glad of the opportunity to contribute something, however little, to the formation of a broader outlook on world architecture; moreover, we think that by this mutual exchange, we too shall be able to increase our very meager knowledge of your country's most original architecture."

A letter has been received from the White House commending the students on the work they have accomplished and urging them to continue it.

From the National Education Association comes a letter —

"We are interested in the project designed to promote educational coöperation between nations of the world."

Another interesting letter is from the American Hellenic Committee in New York —

"We note with interest in the Greek Press the announcement of your establishing a connection with the high schools in Greece. We wish the Roosevelt High the very best success in the interest of Greek-American international ideas."

In order to carry out the work of the international drawing exchange, the drawing department at the Roosevelt High has been organized with an international chairman, three assistants — one for each semester — and in addition, subchairmen for each country in the world. The staff also includes an editor and assistant, stenographers, interpreters of foreign languages, a custodian of mailing, a philatelist, and a manager of exhibits.

Every summer a number of Roosevelt students visit foreign countries. Whenever possible they are appointed emissaries. Last summer Miss Birgit Vennesland, a superhonor student at Roosevelt, visited Norway and carried with her a message of good will. She was accordingly given letters of introduction to the American Consuls who aided her in talking directly with educators and explaining the plan of her fellow students. Another student, Albert Schuller, visited Germany. He made similar contacts and visited German schools, giving them first-hand information of the international drawing exhange. The main purpose of these messages was to create a more friendly relation between the students of schools in the United States and those of foreign countries, thereby breaking down barriers that have separated one nation from the other.

A few of the countries to which mechanical, architectural, and machine drawings have been sent are the following Australia, Norway, Panama, Scotland, Switzerland, Germany, India, and Luxemburg.

Among the drawings received so far are interesting specimens of an ornamental character from students in Athens, Greece. A large number of prints have been received from students in Hungary typical of architecture in that country; also a complete set of mechanical drawings from students in the Cristobal High School, Canal Zone, Panama, and from the Allen Glen School, Glasgow, Scotland. This summer a large package containing about one hundred drawings was received from the Minister of Commerce and Business, Berlin, Germany. These drawings were executed by free-hand, architectural, and engineering students in the State Technical School in Berlin and Neukoeln, Germany. Drawings of an architectural nature have also been received from the J. J. School of Art, Bombay, India. The drawings received were the object of eager inspection while on exhibition at the school, and as one student was heard to remark, "We take an interest in the work done by foreign students and entertain a measure of admiration, respect, and friendliness for the young craftsmen."

It is hoped eventually to establish permanent and traveling exhibits of the work of student architects and engineers, not only here in Chicago but in all the principal cities of the world. Just last fall the Junior City Club of Chicago sponsored an exhibit of international drawings loaned to them by the Roosevelt High. These drawings were on display in the lounge of the City Club, 315 Plymouth Court, from Saturday morning, October 25, to November 1. It was encouraging to have ten foreign consuls present at the formal opening. Many favorable comments were received from the foreign consuls, educators, and interested visitors from Chicago and elsewhere. A number of executives

of the Board of Education who also visited the exhibit at the City Club were interested in having it brought to the Board of Education, 460 S. State Street, where it remained on display during the convention of the Illinois Vocational Association.

The international drawing exchange has just begun and we sincerely trust the project will expand so that other schools in Chicago and elsewhere will take an active part in its growth. It has been suggested by Mr. Bauersfeld, director of technical education, that the high schools in Chicago and elsewhere organize a committee to coöperate with the international drawing exchange which is already on a workable basis. Each school could be assigned one or more countries, their duty being to take care of all correspondence and exchange of drawings with the country or countries to which they had been assigned. In this manner more contacts could be made and the project enlarged. In 1933 at the Century of Progress Exposition a very large and representative display of drawings could be arranged which would include all the countries of the world.

Making a Zinc Etching

*R. Randolph Karch**

A Related Subjects Lesson for the Printer

IT IS rather difficult for the printing student to visualize the various processes used in making a line etching or a halftone. To thoroughly understand this, one should really visit a photo-engraving plant. As this is not always possible or convenient, pictures of the procedure are probably the next best thing for getting some understanding of the processes.

Figure 1 shows the workman carefully cleaning a heavy piece of plate glass with lye. After this has been done, the plate must be thoroughly rinsed with clear water.

Washing the Glass
FIG. 1

The next step is to coat the plate with albumen (white of egg) which has been dissolved in water. After the coating has been applied as shown in Figure 2, it must be allowed to dry thoroughly.

Coating Glass with Albumen
FIG. 2

Figure 3 shows the application of the next coat which consists of collodion (a sticky solution of guncotton in a mixture of alcohol and ether). This coating must be allowed to set until it is partly dry.

Coating with Collodion
FIG. 3

The plate is next immersed in a lightproof tank containing nitrate of silver. This process is shown in Figure 4. It is allowed to stand in this tank for 5 minutes during which time silver nitrate, which is sensitive to light, is deposited on the collodion surface.

Dipping Plate in Silver Bath
FIG. 4

The sensitized plate is now ready to be placed in a plate holder, as shown in Figure 5. This must be done in the dark room.

Placing Wet Plate in Plate Holder
FIG. 5

The plate holder is then ready to be placed into the camera. When the slide of the plate holder is withdrawn and the lens is uncapped, an exposure is made on the sensitized plate. This is called "photographing the copy" and is shown in Figure 6.

Photographing the Copy
FIG. 6

After the sensitized plate has been exposed, it is called a "wet plate." It must be developed as shown in Figure 7, after which it is known as a "negative."

Figure 8 shows how the negative is given a coating of rubber cement. After this has dried a coat of collodion is placed over the rubber cement and this also must be allowed to dry.

The negative is then ready to be cut, after which it is soaked in acetic acid, and is then ready to be stripped from the glass, as shown in Figure 9.

Developing the Plate
FIG. 7

The stripped negative is next placed on another piece of plate glass, care being taken that it is turned over so that the printing of the subject will not be backwards.

Coating with Rubber
FIG. 8

The method of placing the negative on the plate glass is shown in Figure 10.

The next step is to take the zinc plate which is to be etched and thoroughly scrub it with powdered pumice and water in order to give it a mat surface, to which the succeeding coating

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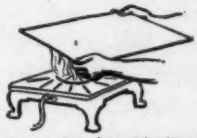
will adhere. This is shown in Figure 11.

Figure 12 shows how this zinc plate is then coated with a solution of albumen, water, and bichromate of ammonia.

After the zinc plate has been thus coated, it is dried over a gas stove in a dark room, as shown in Figure 13.

Squeegeeing—Turned Negative to Plate Glass
FIG. 10

Coating with Sensitize Solution
FIG. 12


Drying Sensitized Coating on Zinc Plate
FIG. 13

Heating Zinc Plate
FIG. 18

Powdering Zinc Plate with Dragons Blood
FIG. 21

Scrubbing Zinc Plate with Powdered Pumice
FIG. 11

The negative is next placed in a printing frame. The zinc plate is placed in close contact with it and the whole is exposed to a very strong light for about 4 minutes. This is shown in Figure 14.

Zinc Etching Machine
FIG. 20

The zinc plate is now called a "print." It must next be rolled with a leather roller, as shown in Figure 15, which coats it with specially prepared ink.

The zinc plate is then placed under a faucet of running water and rubbed gently with a piece of cotton. Wherever the negative was transparent, the light made the coating on the zinc insoluble; hence this remains on the zinc as the picture. Figure 16 shows how this process is carried through. Wherever the light did not strike the zinc the coating washes off, leaving the bare zinc exposed.

Printing Through Negative on Copper Plate
FIG. 14

Rolling Ink over Zinc Print
FIG. 15

The zinc print is next slightly warmed so that the ink becomes tacky, after which a red powder, which consists of a dark-red resinous substance called dragon's blood, is then dusted over it. This sticks only to the tacky ink portions of the plate. Figure 17 shows the application of the dragon's blood.

Removing Ink & Coating From Unexposed Parts
FIG. 16

Powdering Zinc Plate with Dragons Blood
FIG. 17

The next step is to heat the plate over a gas furnace until the coating of dragon's blood melts. This is shown in Figure 18.

Figure 19 shows how the heated plate is then quickly cooled.

Cooling Zinc Plate
FIG. 19

The dragon's blood then forms an acidproof coating over all the lines in the picture.

Figure 20 shows the workman placing the zinc plate in an etching machine which dashes a solution of nitric acid and water over the plate. The acid etches away those portions of the zinc plate which are unprotected by the dragon's blood. This first etching or "bite" requires about 30 seconds.

After the first bite has taken place, the zinc plate is again dusted over with dragon's blood, as shown in Figure 21. The surplus powder must be brushed off the plate and care must be taken so that the powder is brushed up against one side of the etched portions.

Heating Zinc Plate
FIG. 22

Figure 22 shows how the plate is again heated over the furnace in order to make the dragon's blood melt and cover up the top and one side of the line.

Cooling Zinc Plate
FIG. 23

The plate is then cooled as shown in Figure 23, and dragon's blood is again applied. The operations shown in Figures 22 and 23 are repeated three or more times until all of the etched lines have had a dragon's-blood coating, from every side. This prevents the etching under of the printing surface. After every heating of the plate it has to be cooled as shown in Figure 23, before the next application of the dragon's blood.

Zinc Etching Machine
FIG. 24

The zinc plate is then again placed in the etching machine for the second bite which lasts for about 1½ minutes. Then the entire process illustrated in Figures 21, 22, and 23 is repeated, after which the plate is put into the etching machine for the third bite which requires about 3 minutes.

Routing Machine
FIG. 25

Again the plate is dusted with dragon's blood, heated and cooled four more times and then it is placed into the etching machine for the final bite which requires about 8 minutes. The acidproof top is then removed from the plate with hot lye.

Hand Tooling the Plate

FIG. 26

The next step is to route out the more open-etched places on the zinc plate so that they will not catch the ink from the press rollers and smudge the paper. This process is shown in Figure 25.

Pulling the Proof

FIG. 27

The zinc etching is then inspected and when necessary hand-tooled, as shown in Figure 26, to insure perfection after which it is trimmed to size.

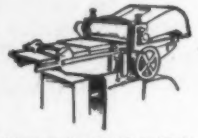
Blocking the Plate

FIG. 28

Figure 27 shows how a proof of the plate is pulled so that comparison between it and the original copy may be made.

Figure 28 shows how the thin zinc plate is fastened to a wood block with a nailing machine. This is done to make it approximately type high.

The block plate is then placed in a special planer shown in Figure 29 which planes it exactly to type high. This is really the finishing process in making a zinc etching.



Planing the Cut Type High

FIG. 29

Shall We Teach Masonry?

*Everett Kampel**

MASONRY has, in many instances, been omitted from the list of subjects offered by trade and vocational schools. The educator who is planning a curriculum on a trade basis, usually, if he considers masonry at all, regards it as separate and specific courses, such as bricklaying and plastering. However, a general masonry course combining bricklaying, plastering, concrete work, and as much stonework as is required locally can be instituted easily, economically, and advantageously.

By questioning architects and builders, one will discover that the apprentices who now learn "on the job" alone cannot hope to become the craftsmen their predecessors were. Even though he had the time, the average journeyman of today does not consider himself obligated in any way to furnish instruction to the aspiring apprentice. If he does take an interest in the boy, the journeyman is not always a good teacher. Consequently, day after day, the boy goes through the same routine of "laying brick to the line," rough "backing-up," and even doing menial tasks which furnish no trade training. The more proficient an apprentice becomes at a certain type of work, the less chance he has of being transferred to something which would furnish new instruction. Experimentation is

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costly in any industry. Why should the mason contractor decrease production and lessen his profit by shifting the apprentice?

Contrast with this, the modern trade school where a competent journeyman, with teacher training, has analyzed the trade and arranged it into progressive jobs. Following this definite course, the boy systematically goes through all the instructional units in his trade as fast as he can assimilate them.

aside their tools and give way to younger men. Many of these older men came to this country as immigrants, but with our present strict immigration laws, they will have to be replaced by men who have learned the trade here.

From a vocational-guidance standpoint, masonry holds a strong position. Consider what the world owes the mason for the modern skyscraper, the beautiful public buildings, and memorials. There is a feeling of

In addition to the actual practice with the tools, the pupil has the opportunity of studying science, estimating, and blue-print reading as related to the trade. These subjects give the boy a broader education than he can hope to get "on the job." He regards his trade in a larger sense; he can see where he is going.

After graduation, will there be work for the apprentice? Brickwork, stucco, and other forms of masonry are fast taking the place of wood with its ever-present fire hazard and high maintenance cost. In the larger cities, especially, there are many buildings which, having outlived their profitable usefulness, are being torn down and replaced with modern structures of steel and masonry. According to figures compiled by A. E. Dickinson, president of the Indiana Limestone Company, there are 14,000,000 buildings in the United States that should either be remodeled or replaced. He estimates that 1,000,000 new houses yearly are necessary to meet the demand for new homes. With the constant increase in population and higher standards of living, there should be a large amount of new building yearly.

Considering the labor supply, we find that a large proportion of the masons now working have passed the age of greatest ability. They will soon have to lay

pride to the tradesman as he sees the building on which he is working, steadily rise and approach completion. The variety of work encountered in this trade makes it always interesting.

Let us consider the more concrete advantages. Masonry is one of the most healthful occupations because the work is done in the open air. There is no competition from women bringing with it a lower wage scale. In practically every other trade, machinery has been invented to replace some handwork, but it seems utterly impossible to conceive a machine which can lay bricks under such varied conditions as occur in modern construction. And, finally, the average yearly wage compares favorably with that of any other trade.

As in other vocations, the masonry apprentice's future is largely what he makes it. If a man is capable, well-trained in blue-print reading and trade mathematics, if he knows how to handle men, he has a good opportunity for advancement to foreman. If his education includes a technical course, he may become a superintendent. Again, with business ability, he may often be successful as a mason or general contractor. In short, the possibilities depend upon the ability and ambition of the individual.

A masonry course, general or specific branches de-

pending upon the demand of the community, could well have a place in many trade schools. To a certain type of boy, it not only makes an appeal but fills a definite need. To the exceptional boy, it offers the same opportunity as any other trade. Why not teach masonry?

Handling Odd Jobs in the School

*Fred C. Finsterbach**

NONSHOP TEACHERS seem to have the innocent but erroneous impression that the shop teacher is *glad* to get rid of a boy or two for running errands, replacing a coat hook, painting a chair, etc., at any time.

A surprising number of irksome interruptions to do such special jobs may occur before the shop teacher finally succeeds in making it perfectly plain that he, too, is entitled to some "sacred moments."

Odd jobs happen in the best of regulated schools; in fact, the better the regulation, the more jobs are apt to happen. In handling this matter, the shop instructor is usually free to accept or decline. If he declines to participate, he loses a good chance to place his line of work on a par with other school subjects in regards to social efficiency. If, on the other hand, he accepts them, obviously some sort of system ought to be worked out so they may be handled effectively, without interfering too much with the regular course of study.

Boys like to do jobs about the school, but the odd job is only a lark to a boy unless he can be brought to realize that it is worthy of careful effort. The odd job brings a boy in contact with conditions which approximate life situations later to be encountered. It also trains him to think socially, for a repair or an installation service in a room will perhaps benefit all of the pupils meeting in this room.

Since the haphazard, come-when-you-please program for the jobs around the school is manifestly inconsistent with the many benefits to be derived when request and response are handled systematically, the following plan is offered as a solution that has been verified by continued use:

1. A set of common tools — hammer, pliers, screw driver — should be made available for use by teachers without sending to the shop. This enables them to have simple jobs done by their own pupils.

2. A work-order form should be provided for the larger jobs and constructions. This is to be filled out, O.K'd by the principal, and placed in the *instructor's mail box*.

3. Teachers in the room where work is done should check the time of the boy on the job. They should also comment on the work done so that a record may be kept of how jobs are done. By this device the boy may enjoy the satisfaction justly his on the completion of a satisfactory job.

4. It should be generally understood that the work be done at the shop instructor's convenience.

By this means, work and time can be credited to the respective shop, boy, teacher, and school, to the greater satisfaction of all.

WORK ORDER

Date..... Room.....

Please do the work described below:

When wanted.....
Teacher.....
O.K.....
Prin.

ODD JOB RECORD

Date..... Room.....

Time ....
From To

The following boys are assigned to do work requested by you. Please check time and add a comment on the work.

.....
.....
.....

Comment:

.....
.....
.....
.....
.....

Teacher.....

*Buffalo, New York.

ONE OF THE MEMORIAL MURALS, TILDEN TECHNICAL HIGH SCHOOL, CHICAGO, ILLINOIS

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. METZ, Editor

THE OPENING OF SCHOOL

In a comparatively short time the school shop will again throw open its doors, and the regular activities of the school year will speedily assume the routine aspect of the school in operation. Some of these school shops will be in charge of teachers who are new to the game, others will be managed by the man who has presided over them in the past, and still others will be placed under experienced teachers who have served their apprenticeship elsewhere and have chosen to change their allegiance from one school to another for any of a number of legitimate and worth-while reasons.

To the teacher who comes back to his old shop, little need be said. The very fact that he is coming back shows that he possesses a record of successful accomplishment. Probably it may be well, however, for him to briefly ponder over the events of last year. Have all the improvements been made in shop arrangement; outline of instruction; units of instruction; methods of keeping records; system of taking care of and distributing tools, materials, and supplies; and methods of assigning duties to the students, that the experiences of the past have suggested? There is still time to make needed changes now, or to plan for making them during the coming school year.

For the teacher who is just entering his first teaching job, probably the best advice is that he carefully prepare for his first appearance in class. Much depends upon the first impression on his students. Boys quickly detect sham and bluff; hence, the beginner should avoid all semblance of anything that smacks of the artificial. He must, above, all remember that it is not necessary for him to assume the pose of one who possesses encyclopedic knowledge even of the subject which he is to teach. Students recognize the fact that there are few people who know everything about any subject, and the teacher who frankly admits that he has much to learn makes a much better impression on his class than one who claims he knows it all and then demonstrates that he does not.

For the new shop teacher, probably the best advice is to prepare carefully for every lesson. Plan every bit of work carefully and put down everything on paper. In this way much laborious preliminary work can be preserved for future use. Then he should be sure to have on hand samples of his own work which may be inspected by the students. They may not be able to do good work themselves, but they can recognize good work when it is presented to them. For this reason, the samples presented by the teacher and the work that he does during demonstration periods must be faultlessly executed. It is by what he does, rather than what he says he knows, that the good shop teacher impresses his students.

Then there is the experienced teacher who is just entering a new school system. He may know how to teach properly, and yet do much harm if he does not carefully avoid criticizing detrimentally anything that his predecessor may have done. An incautious word is frequently all that is necessary to set the student body against a new teacher. Teaching is hard enough without introducing mental resistances which are difficult to overcome, and which nevertheless must be subdued before the most effective work can be accomplished.

Another chance for a serious misstep is to place the blame of the lack of student accomplishment on his former instructor or instructors. Of course, this procedure may be looked upon as the great American indoor sport, but term it what we may, it is and remains just plain "buck passing." The kindergarten teacher blames the parents, the grade teacher blames the teachers in grades lower than hers, the junior-high-school teacher blames the grades, the senior-high-school teacher blames those in the junior high, the colleges and universities blame the high schools, the professions, commerce, and industry blame the entire school system, and so on.

Since the whole procedure is so futile, at least shop teachers should recognize the futility and indulge in no such useless practices. The task which confronts any teacher is to instruct those who are placed in his class. If some faulty system gives him students who are not prepared for his subject, then it is up to him to arrange his plans to do the best he can with what has been given him. It is unlikely that the system will change, or if it does, the change will go forward very slowly. In the meantime he has to carry on, and whining about his job will not only not help him, but it really unfits him to make the best use of his faculties.

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THE QUESTION OF SAFETY

With the beginning of the school year, the question of safety in the school shop again comes to the fore. This is as it should be because it is one of the most important questions that confronts the shop teacher. Usually, when an accident occurs, the onus falls on him because he is considered responsible for what happens in the shop. Whether the fault of the accident can be blamed rightly on him is another question; the fact remains that he is held accountable and may be so adjudged even in a court of justice.

In this matter of accident prevention the school can well learn a lesson from industry. There was a time when accidents were looked upon as unfortunate but unavoidable. Then someone with keen vision and courage told industry that this slaughter and maiming of workers was not only unnecessary and criminal but that it was avoidable, and that industry had the responsibility of doing away with it.

Of course, this gospel was not adopted at once. One would hardly expect that from employers who, when accidents did occur in their factories, tried in various

ways to shift the blame on the employees involved. As an illustration, one manufacturer tried to place the blame of all accidents occurring on a circular saw, which was a necessary part of his shop equipment, upon any operator who might use it by posting the sign, "Employees use this saw at their own risk," near the machine. There was no guard on the machine, either. It took effort and time to break down such practices but persistence conquered in the end, and today at least all of the larger industrial establishments take the matter of safety very seriously. Not only do employers provide every type and kind of safety device to protect their workers, but they attempt to develop in their employees habits of safety. To this end they employ such features as safety bulletins, literature, safety talks, moving pictures, safety drives and campaigns, safety committees, safety questionnaires, individual and departmental prizes, decorations for outstanding no-accident records, etc.

Just recently the Universal Atlas Cement Company, a subsidiary of the United States Steel Corporation, celebrated the establishment of a new safety record, when all nine of its plants, together with its quarries and connecting railroads, had gone through the month of June without a single lost-time accident.

Many of the methods used for inculcating safety practices that have been found helpful by industry are used in school shops throughout the country, but their use is not widespread enough. Every shop teacher ought to be an ardent safety advocate. To this end he must set a good example by always practicing safety himself. He must make his shop safe by installing proper and adequate safety devices. He must preach and enforce safety regulations. He must make use of all of the many devices that industry has found helpful in this work. It is only in this way that he can fully live up to his responsibilities in the training of the workers of the land.

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A WORTH-WHILE EXPERIMENT

Recently a group of 96 boys and girls who had just been graduated from the eighth grade were invited to Washington, D. C., to participate in an experiment, the purpose of which was to demonstrate the value of the motion picture to education.

The test extended over four days. The boys and girls who were subjected to it came from different parts of the United States, having been sent to Washington by the governors of their respective states.

Experiments of this kind are valuable. They are spectacular, it is true, and may appear to throw special glamour over the products of a certain manufacturer or producer. This, however, need not necessarily influence the results because the main idea of the experiment is to show the real value of films in the school. Whether the films and sound records that were used in the test were produced by one or several film corporations would not alter the findings, especially now when all producers are successful in making high-class photographic records.

There then remains only the selection of the material to be presented and the method of presentation. This, too, has been given very serious consideration by producers, and the near future will see another valuable teaching aid placed within the reach of the teacher.

The ease with which the projector may be set up in the classroom, the silver screen adjusted, the film placed upon the reel, and the sound mechanism started, should not mislead the teacher, however. The moving picture and the sound film are and will always remain only a teaching method. They do not replace the teacher. He must not forget that every teaching method is but a tool — more or less helpful in the work of educating the young, it is true, but still only a tool.

He must remember in spite of all teaching helps, his energy and enthusiasm must furnish the spark which will enkindle the flame of patriotism, loyalty, religious zeal, love for fellow man, righteousness, and ambition in the hearts of his students. Unless this new tool is used in this sense by the teacher, it will be only another step in the mechanization of education, and education above all must remain something vital and growing, and not something that is moving merely with the mechanical precision of a machine, no matter how wonderful.

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THE PERSONAL TOUCH

"Good morning, John; hello, Will; glad to see you back Albert, are you feeling all right again? Jim, I wouldn't start scuffling in the shop; etc., etc."

This from a shop teacher, in a certain junior high school, who was in the habit of standing at his door at the opening of class to greet his students as they entered. In this friendly way he made a personal contact with each boy at the very beginning of the class period.

The value of such a contact cannot be overestimated. It invites a pleasant retort from the student and sets the stage for a continuance of pleasant relations during the remainder of the class period. Of course, it does not entirely do away with the slight disturbances incident to the opening of class, but it does minimize their occurrence.

Take the opposite kind of picture, where the teacher is busy at his desk or elsewhere, not paying any attention to those who enter except in a coldly critical manner. The frigid atmosphere prevalent in such a classroom exerts a repellant influence on the entering student that may seriously affect his attitude toward the work which he is about to begin.

Since the teacher must be vitally interested in developing correct attitudes in his students, he cannot afford to let any opportunity pass to get in friendly personal contact with them. The beginning of the class period furnishes a very opportune moment for doing this, and the results obtained will more than offset the loss of time that may accrue because of the attention entailed.

The How and Why of a Project

*George A. Phillips**

THE people of the United states have an abiding conviction that public education is the best means for assuring individual happiness and general good citizenship. They have not been content to reserve the privileges of education for a leisure class, nor have they been willing to accept the theory that a good "general education" is particulary suited to all conditions and circumstances. Changes in the economic order have made it increasingly expedient to develop many differentiated types of schools to meet the educational needs of varied groups. The continuation school is one of the distinctive types so developed.

In our widely diversified system of public schools each type should demonstrate in its service and its technique the distinctive characteristics which justify its existence as a separate unit of the tax-supported program. The continuation schools of Massachusetts are operated on such a plan. The director of the division of vocational education of the Massachusetts state department of education has outlined the distinctive characteristics upon which approval for these state-aided schools is based.

The continuation-school instructors in Easthampton have sought to make the work distinctively suitable for working boys and girls 14 to 16 years of age. The uniform statement of characteristics referred to in the foregoing serves as their guide.

Obviously, the boys' work and girls' work differ in certain essentials and this article therefore hinges upon the work with the boys.

As a starting point we adopt the policy that the training afforded these boys in the school should have its inspiration in the fact that they are employed at real work. Advancement in industrial usefulness and standing is emphasized in our program, but we are certain that the general improvement of the boy is best facilitated by the very specificness of this objective. Manual instruction opportunities are an absolute essential. No other medium can as adequately serve the following ends:

1. Interpretation of industrial methods and customs.
2. Development of correct industrial habits and attitudes.
3. Application of fundamental knowledge to real job situations.
4. Selection of more suitable occupations by young workers who have found themselves misplaced in their initial employments.

Out of a total of 43 continuation schools in Massachusetts which conduct a boys' division, our school is one of the 37 which offer woodworking as a feature of the shop opportunities afforded. Our shopwork, in common with about 14 other continuation schools in Massachusetts, is operating almost entirely on the so-called factory basis, all or a group of boys, coöperating to produce a quantity of each project instead of each boy completing an individual project.

In this article we do not wish to discuss at length the merits of the factory plan of production in continuation schools. Our experience with it has been very satisfactory. It has enabled us to carry on our work with less waste in material and time, and to make a better product. The outstanding features of commercial production — uniformity in size, and construction, and finish, and work with fixtures and jigs — are more nearly possible of achievement in the school shopwork so organized. Pupil response has indicated that the boys are interested in this method of production, possibly because it may relieve the tedium of long work on a single article, and certainly because of the beneficial stimulus of a community effort. This plan requires a division of labor which allows the instructor to fit more accurately the varying grades of work to the aptitude of the pupil, both in the shop and the related classroom work. These, then, briefly present some of the by-product results of our use of this form of production.

But of more weight than all, the factory method of production instruction is most distinctively suitable and useful for boys whom we are seeking to "Advance in industrial usefulness" in plants which are themselves producing commodities by the mill or factory method. To us, these points taken from the outline of characteristics are fundamental.

1. The continuation school should, in the (shop) training afforded, maintain an occupational atmosphere.
2. Such training should be centered about real jobs.
3. Commercial standards should be maintained in the product.

We can do this best in incorporating in our service technique the factory plan of shop management. To illustrate our use of this plan we submit the following account of the production of tea-service stands in our shop.

The original of these tea services (or muffin stands) which are shown in Figure 1, was purchased in South America. It came to our school shop for repair. Its advantages were apparent, hence a market for the project sprung up, and we set to work producing an order of 35 of them.

Having received permission from the owner to copy the article, we presented the idea in our related classroom periods. Here the merits of the project were discussed somewhat as follows: General use for this project and possibility of a market, original design, and possibilities of new instruction and practice offered by constructing the project. A favorable discussion resulted in a decision to adopt the project.

An assembly drawing, and a detail drawing of each part were made by the instructor, and ten blue prints

*Continuation School, Easthampton, Massachusetts.

of each drawing were made by the boys after a study of the blue-printing process. Next came the study and reading of the prints in the classroom. Each boy was given the following questionnaire to be answered from the blue prints to show that he fully understood the drawings.

Blue-Print Reading

Instructions: Study the assembly and detail drawings of the tea service. Fill in the dimensions of each part, and figure quantities required for 35.

Base, Part No. 1

Number required .....; length ....., width ....., thickness .....; dimensions of the mortise: length ....., width ....., depth .....; how far in from the top edge is the mortise? .....

Long Upright, Part No. 2

Number required .....; length ....., width ....., thickness .....; how far in from the point is the mortise? .....; how long is the mortise? width ....., depth .....; what is the length of the tenon on the end? ....., thickness? .....; how far is the first hole from the shoulder of the tenon? .....; what is the difference between the first and second holes? .....; what is the diameter of the holes? .....; how deep are the holes drilled? .....

Short Upright, Part No. 3

Number required .....; length ....., width ....., thickness .....; how far up from the bottom end is the first hole? .....; what is the distance between the first and second holes? .....; what is the diameter of the holes? .....; how deep are the holes drilled? .....

Handle, Part No. 4

Number required .....; length ....., width ....., thickness .....; how long is the tenon on each end? .....; thickness .....

Shelf, Part No. 5

Number required .....; length ....., width ....., thickness .....; what is the diameter of the recess? .....; depth .....; what is the width and depth of the chamfer on the bottom? .....; how far in from the corner does the chamfer on the ends stop? .....; how far in from the edge are the pilot holes in the end of the shelf? .....; how deep are these pilot holes drilled? .....; how many pilot holes in each shelf end? .....; how far from the center line is the first pilot hole in the bottom of the shelf? .....; what is the distance between the pilot holes in the bottom of the shelf? .....; how far in from the ends of the shelf are these holes drilled? .....; how deep are these holes drilled? .....; what is the diameter of the pilot holes? .....

Cleat, Part No. 6

Number required .....; length ....., width ....., thickness .....; how far from the ends are the holes drilled? .....; how far in from the sides are the holes drilled? .....

Bearing, Part No. 7

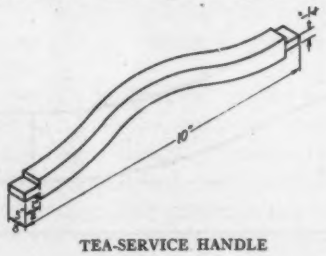
Number required .....; length, ..., width ....., thickness .....; how far up from the bottom is the pilot hole? .....; how deep is the pilot hole? .....; diameter of the hole? .....; how far in from the ends are the holes for the 5/16-in. No. 4 screws? .....; what is the diameter of these holes? .....

By checking the answers, as given, difficulties were discovered and explained, thus eliminating much confusion in reading the drawing when at work in the shop.

Next came class discussions for the purpose of analyzing each part of the tea service to determine the proper procedure in the shop. This analysis resulted in a series of job sheets which outlined the schedule of work to be done on each part. These job sheets supplement the teacher's efforts in the shop and they also serve as a source for the related assignments by which we develop skill in planning our work and the ability to search out and apply appropriate technical information. The following analysis shows the various operations in making 35 handles, according to the limits of our shop equipment.

Shop Job Sheet
Tea-Service Handle
(See detail drawing of Part No. 4)

1. Check details of dimension and construction as shown in this drawing with those on the detail drawing.
2. Select stock for 35 handles.
3. Plane to thickness.
4. Plane best edge straight and square.
5. Rip to proper width allowing for planing the edges.
6. Plane edge in surface planer.
7. Cut pieces to proper length in miter box.
8. Make a template.
9. Place template on board, and mark around it.
10. Sand on band saw.
11. Smooth curved edges.
12. Cut tenon on each end.
13. Sandpaper each surface.



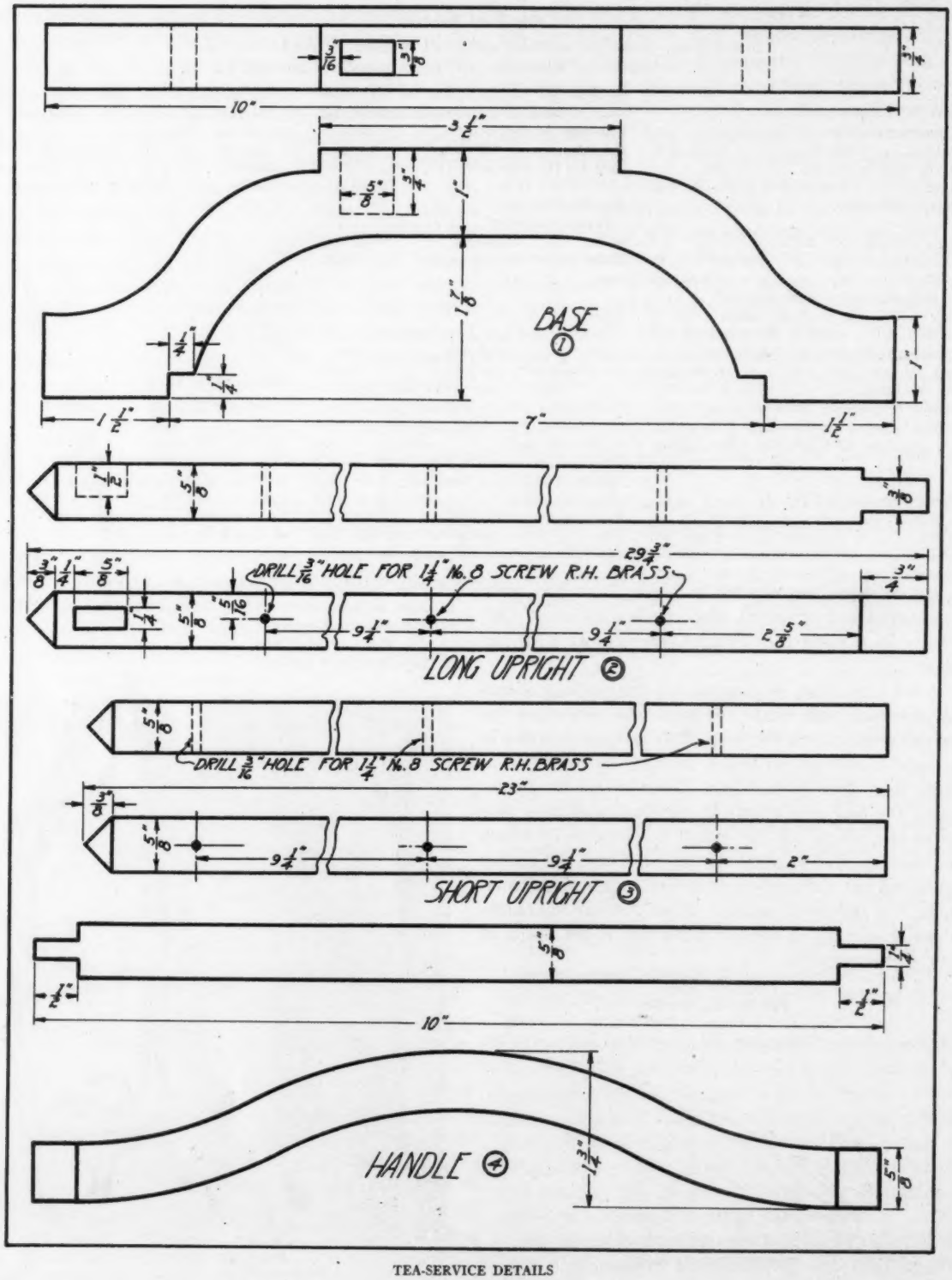
TEA-SERVICE HANDLE

FIG. 1. TEA SERVICE

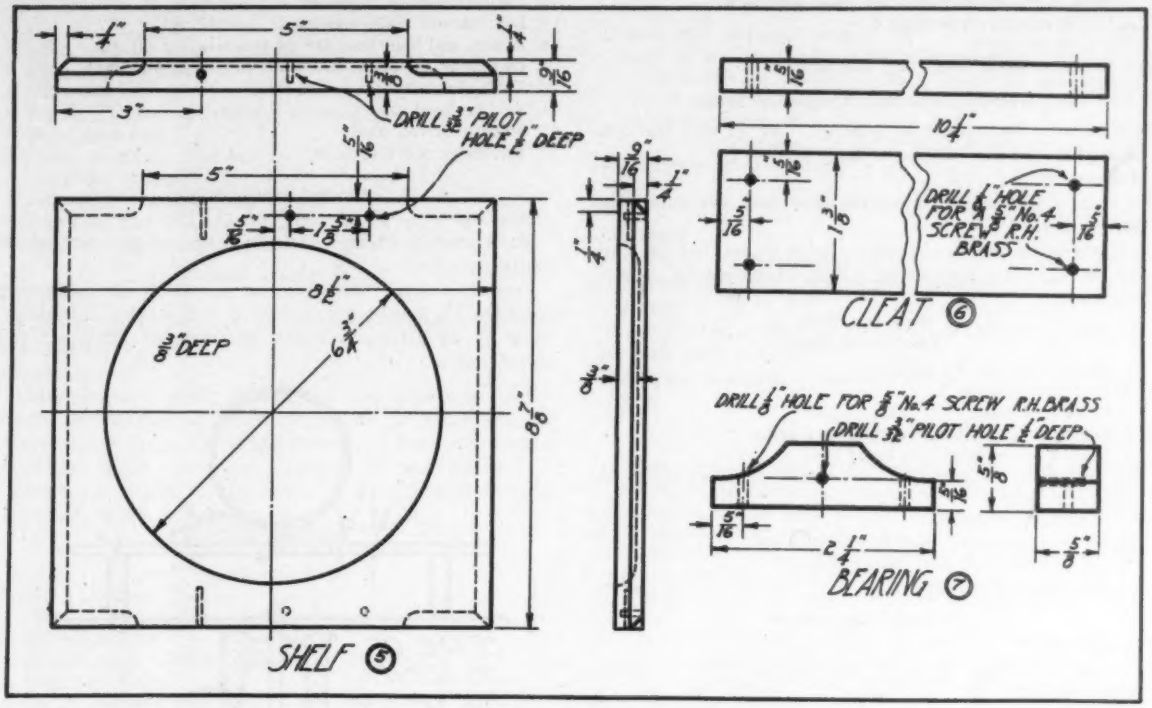
This sheet is used in the shop in conjunction with the detail drawing of the part. The isometric sketch shows the finished handle.

Many of the operations to be performed on the several parts of the project are already familiar (from past experience and instruction) to the boys working on a part. However, if an unfamiliar trade operation presents itself, that operation is carefully analyzed by the pupils and blue-printed for reference on the job at the proper stage. The use of these instruction sheets is illustrated at a later point in the article.

Then comes the problem of dividing the labor. The small membership of our shop classes makes this an easy task without any great detail in paper work. The



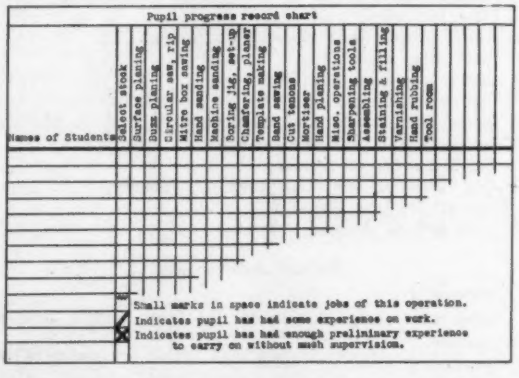
TEA-SERVICE DETAILS


DRILL 3/32" PILOT HOLE 1/2" DEEP
SHELF (5)
CLEAT (6)
DRILL 1/8" HOLE FOR 3/8" No.4 SCREW R.H. BRASS
DRILL 1/8" HOLE FOR 3/8" No.4 SCREW R.H. BRASS
DRILL 3/32" PILOT HOLE 1/2" DEEP
BEARING (7)

TEA-SERVICE DETAILS

ability and aptitude of the boys is, of course, varied, and we find that practically all of our jobs afford a sufficient range of learning and performance difficulties to permit the instructor to assign to each boy the grade of work which is suitable for him.

Some forms of progress records are necessary. Our small membership again helps us in this particular. The instructor is thoroughly acquainted with each boy — knows what he can do, and what he is doing. The state department furnishes each school with the form



shown in their bulletin for shopwork for continuation schools. A copy of that chart with changes to suit our needs, follows:

In the tea-service project, we find, by analysis, that there are approximately 24 operations which are listed in groups according to difficulty ratings. Jobs are classified as skilled, semiskilled, and unskilled, and are then assigned to boys with corresponding skill ratings. For instance, the operation of band-sawing the base, we classify as a skilled job and is assigned to a boy who has attained suitable proficiency in this operation on similar work that was less difficult. His progress record will show just how much band-sawing he has experienced. If the instructor thinks it necessary, the pupil is referred to a blue-printed instruction sheet telling how to use the band saw for cutting sharp, irregular curves.

This procedure is continuous throughout the production process until all the parts are complete, ready to finish and assemble. We deliberately use the order, finish and assembly, because that is our actual method on 90 per cent of our projects.

Our shopwork is not a trade-training enterprise — it is a device upon which we hinge related instructional activities designed to promote particularly suitable general improvement for the boys who are already a part of the 92 per cent of our people who earn their living with their hands. Boys of advanced usefulness in industrial and social citizenship is our major product — not tea-service racks.

It will be noted in the analysis which follows that each part of the tea service constitutes a unit of work, both in the shop and in the related classroom activities.

Shop Job Sheet

Tea-Service Base

1. Select stock for 70 bases.
2. Plane to thickness.
3. Plane best edge.
4. Rip to proper width, allowing for planing.
5. Plane other edge.
6. Cut to length on miter saw.
7. Lay out and make a template.

8. Hold template on wood, and mark around it.
9. Cut in mortise on mortiser.
10. Cut on band saw.
11. Smooth irregular edges and each surface.

Related Classroom Assignment Sheet

Complete the assignment which is tied up with the operation that you perform in the shop.

Assignment 1

Make a working sketch of the base, and give dimensions.

Assignment 2

Construct a template of heavy paper to be used for marking out the bases for cutting. Check template with the original base.

Shop Job Sheet
Tea-Service Shelf

1. Select stock for 105 shelves.
2. Plane to thickness.
3. Plane best edge.
4. Rip to proper width, allowing for planing.
5. Cut to proper length on miter box.
6. Turn recess on lathe (job done outside of school due to lack of equipment).
7. Sandpaper all surfaces.
8. Set up jig and drill pilot hole in each end.
9. Lay out and drill pilot holes in bottom.
10. Cut chamfer on plane.

Related Assignments

Assignment 1

Make a working sketch of the base, and give dimensions.

Assignment 2

List methods commonly used in smoothing parts of furniture. Make any suggestion for speeding up this operation (operation 7).

Assignment 3

Arrange in order of importance the following advantages of using the jig in operation 8.

Make a sketch of the jig.

Shop Job Sheet
Tea-Service Handle

1. Select stock for 35 handles.
2. Plane board to thickness.
3. Plane best edge straight and square.
4. Rip to proper width allowing for planing.
5. Cut to proper length on miter box.
6. Lay out and cut a template.
7. Fasten template and mark around it.
8. Cut on band saw.
9. Smooth irregular edge on lathe drum sander.
10. Cut tenon on ends.
11. Smooth other surface.

Related Assignments

Assignment 1

Make a working sketch of the handle, and give dimensions.

Assignment 2

Figure the items, quantity, and size which would appear on a bill of materials with the headings that follow: Part, Number of pieces, Size.

Assignment 3

List, and sketch type of sanders used in cabinet and pattern shops. Check mark ($\surd$) the types available in our shop. Double check ($\surd\surd$) type to be used in operation 9.

Assignment 4

State by number, the grades of sandpaper commonly used in our shop for operation 9.

Shop Job Sheet
Tea-Service Bearing

1. Select stock for 210 bearings.
2. Plane to thickness.
3. Plane best edge.
4. Rip to proper width allowing for planing.
5. Plane other edge.
6. Cut to length on miter box.
7. Lay out and make template.
8. Fasten, and hold template on wood.
9. Drill holes for $\frac{5}{8}$-in. No. 4 screws (set jig on lathe).
10. Drill pilot hole (set jig on lathe).
11. Saw on band saw.
12. Smooth curved edge.
13. Sandpaper other surfaces.

Related Assignments

Assignment 1

Make a working sketch of the bearing, and give dimensions.

Assignment 2

Copy this detail sketch of the jig set-up for completing operation 12. Label parts, and fill in two missing dimensions. Show by an arrow, in which direction the sandpaper roll should rotate.

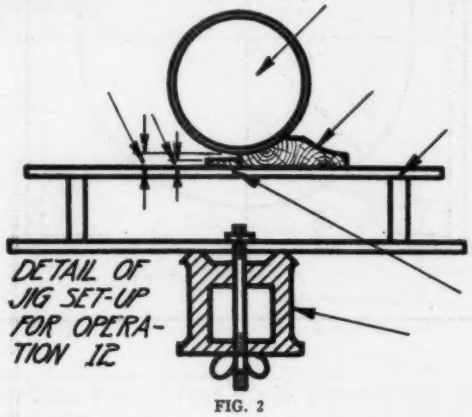


FIG. 2

Assignment 3

Underline, in the list which follows, those methods you have seen used to permanently fasten two or more pieces of wood together. Why use screws in operation 9 on this job?

Nails, glue, dowels, corrugated fasteners, round-head screws, flat-head screws, clamps, hand screws.

Shop Job Sheet
Tea-Service Long Upright

1. Select stock for 70 long uprights.
2. Plane to thickness.
3. Plane best edge.
4. Rip to proper width allowing for planing.
5. Plane other edge.
6. Cut to length on miter box.
7. Cut point on miter box.
8. Set up jig and sand point on lathe.
9. Set up jig and drill holes on lathe.
10. Cut in mortise on mortiser.
11. Cut tenon on end. (See page 37, January, 1929, issue of INDUSTRIAL ARTS MAGAZINE.)
12. Sandpaper all surfaces.

Related Assignments

Assignment 1

Make a working sketch of the long upright and give dimensions.

Assignment 2

Determine the length you would specify on an order to the lumber yard for stock to make 35 sets of uprights.

Assignment 3

State the points you would make in teaching a new worker to use the miter box for operation 6.

Assignment 4

Study page 37, January, 1929 issue of INDUSTRIAL ARTS MAGAZINE article entitled, "Tenoning on a Circular Saw," and study the meaning of each of the following "Trade" terms: working face; working edge; shoulder thickness of tenon; combination saw.

Shop Job Sheet
Tea-Service Short Upright

1. Select stock for seventy uprights.
2. Plane to thickness.
3. Plane best edge.
4. Rip to proper width allowing for planing.
5. Plane other edge.
6. Cut to length on miter box.
7. Cut point on miter saw.
8. Set up jig, and sand point on lathe.
9. Set up jig, and drill holes on lathe.
10. Sandpaper all surfaces.

Related Assignments

Assignment 1

Make a working sketch of the short upright, and give dimensions.

Assignment 2

Determine the width capacity of the thickness planer. Figure the number of pieces which can be placed in the planer at one time. State the reasons in favor of planing in job lots rather than one at a time on the buzz planer.

Determine change in thickness of cut effected by one revolution of the adjustment handle.

Shop Job Sheet
Tea-Service Cleat

1. Select stock for 35 cleats.
2. Plane to thickness.
3. Plane best edge.
4. Rip to proper width allowing for planing.
5. Plane other edge.
6. Cut to length on miter box.
7. Lay out and drill holes (set up jig on lathe).
8. Sandpaper all edges.

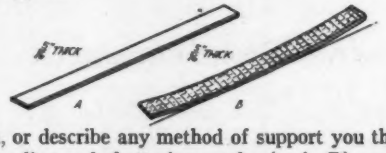
Related Assignments

Assignment 1

Make a working sketch of the cleat, and give dimensions.

Assignment 2

Which of the thin pieces has been put through the planer without support?



Sketch, or describe any method of support you think would prevent curling and chattering marks (as in B) on this stock which is to be planed in the cylinder planer.

Assignment 3

List the job operations necessary to complete the making of the cleats. (See detail drawing.)

Procedure for Filling Grain

1. Select filler, and stir it well.
2. Apply to wood with stiff brush, *with* the grain.
   Allow filler to set until it "flats" (about 20 minutes).
3. Remove excess filler with excelsior, rubbing across grain.
4. Clean surface with cloth.
   (Allow filler to dry at least 24 hours.)
5. Sandpaper with 2/0 paper.

Related Assignments

Assignment 1

Read article "The Making and Using of Filler" to be found in reference file under title, "Wood Finishing."

Assignment 2

In the following list, underscore all woods that should be filled with paste woodfiller.

Oak, pine, mahogany, walnut, chestnut, maple, gum, and birch.

Tea-Service Assembly Operations

1. Glue long upright into mortise on base. Right- and left-hand are determined by mortise on long upright. Be sure the long upright is square with the base, and then drive a small brad through the mortise-and-tenon joint.
2. Fasten cleat on right-hand upright close to the base. See that it is square with the upright.
3. Fasten cleat to left-hand upright with one screw in lower hold.
4. Glue and brad handle in place between each long upright.
5. Set in second screw which was left out in operation 3.
6. Fasten bearings on bottom of shelves with glue and 1¼-in. No. 8, r.h. brass screw.
7. Fasten three shelves between long upright with 1¼-in. No. 8, r.h. brass screws with one washer between the end of the shelf and the long upright.
8. Fasten the short uprights to bearings with 1¼-in. No. 8 r.h. brass screws in the pilot holes, and a washer between as in operation 7.
9. Inspect assembled article.

It is customary to have the parts filled, stained, and shellacked before the assembly operations were begun. They were also rubbed with 2/0 steel wool. In this case, the varnishing was done after the assembly operations had been completed.

Related Assignments

Assignment 1

List the *parts, tools,* and state size, kind, and amount of supplies necessary to assemble ten of these racks. (Refer to blue prints, and assembly operation sheet.)

Assignment 2

Note on paper the utilitarian difference between these items: spikes, nails, brads, sandpaper, emery cloth, steel wool, common washers, and lock washers.

Practical Carpentry

*L. F. Felsted**

IN accordance with the requirement of the state board for vocational education, the carpentry class of Roosevelt High School, Kent, Ohio, attempts as far as possible, to do work of a practical and productive nature.

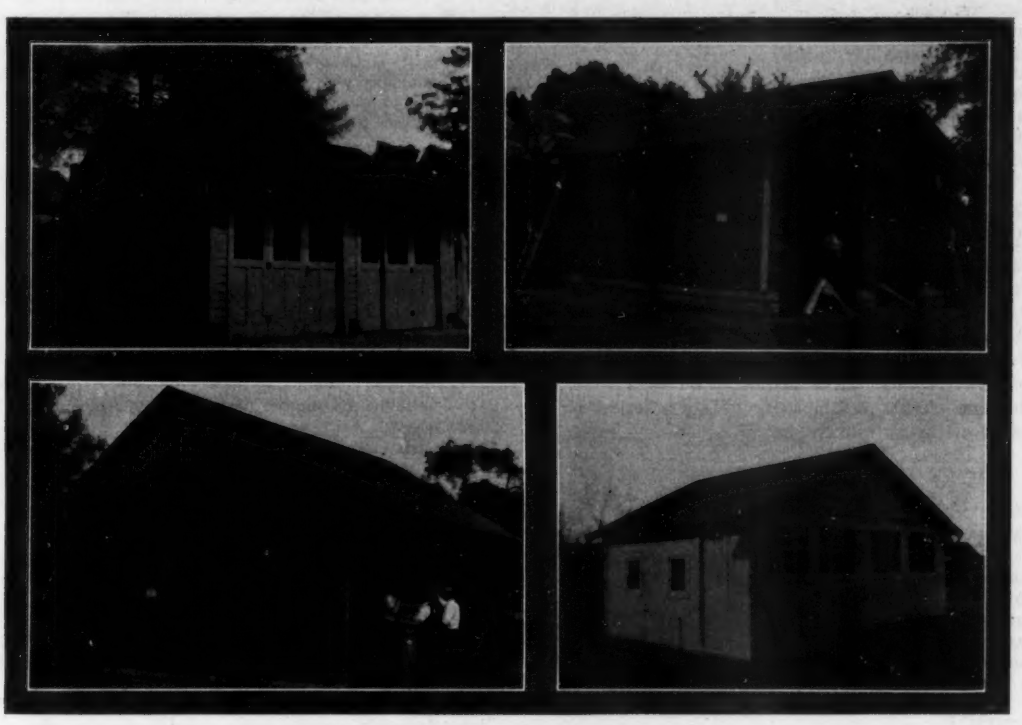
The first half of the year is spent on benchwork, becoming acquainted with the various tools of the trade, and with manipulative processes. During the latter half of the year the activities of the class are transferred to the outdoors and the erection of full-sized buildings is accomplished. This plan presented some difficulties at first due to the lack of suitable jobs, however a workable scheme has now been devised that handles the situation nicely.

The class has confined its efforts to the erection of garages, poultry houses, etc. These are built for any citizen of the community who will furnish the site and the material. The only requirement made is that the foundation be laid by the owner before the class begins work, as it is not within the scope of the instruction given to attempt work of that nature. The build-

*Roosevelt High School, Kent, Ohio.

ing is then erected and painted at no cost for labor to the owner.

No work of this kind is ever solicited and no work is taken on which a carpenter or contractor has figured, or bid, without the consent of that individual. This practice has prevented dissatisfaction on the part of the building fraternity and has resulted in their turning over to the class several jobs for which they did not have time.



WORK DONE BY THE CARPENTRY CLASS OF ROOSEVELT HIGH SCHOOL, KENT, OHIO
L. F. FELSTED, INSTRUCTOR

In the past few years the class, under the writer's direction, has erected quite a number of two-car and single-car garages, and poultry houses, besides numerous smaller jobs. The accompanying photographs show some of the work done.

The boys work in gangs of four to six, each group under direction of a student foreman, and each group sees the project, on which they are engaged through to its completion.

The class is now engaged on what is probably its most interesting job, that of wrecking an old barn and erecting a three-car garage from the salvage material. Plans have also been formulated under which the class erects bungalows for a local real estate firm. This firm furnishes plans, material, and site, and exercises somewhat of a general supervision over work.

SUBSTITUTIONS TO BE MADE

Because of typographical difficulties encountered in properly showing mathematical formulas in the article on "General Intelligence and Mechanical Aptitude in Relation to Trade-School Success" by Max S. Henig, Ph.D., on page 204 in the June, 1931, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, the following substitutions should be made to clarify that article.

Substitute the following formula for the one that appears at the bottom of column 1 on page 207:

$$r_{12.3} = \frac{r_{12} - r_{13}\,r_{23}}{\sqrt{1 - r_{13}^2}\,\sqrt{1 - r_{23}^2}}$$

In Table IV, page 207, the following changes should be made:

Forecast of success is designated by r_{12}

Intelligence is designated by r_{13}

Correlation between forecast of success and intelligence is designated as r_{23}

Mechanical aptitude is designated as r_{14}

Success and mechanical aptitude is designated as r_{24}

Directly beneath Table IV on page 207 the result of a calculation should appear as follows:

$r_{12.3} = 6.04$

Near the bottom of the second column on page 207 the following two formulas should be substituted in their proper places:

$$r_{12.4} = \frac{r_{12} - r_{14}\,r_{24}}{\sqrt{1 - r_{14}^2}\,\sqrt{1 - r_{24}^2}} \qquad r_{14.3} = \frac{r_{14} - r_{13}\,r_{43}}{\sqrt{1 - r_{13}^2}\,\sqrt{1 - r_{43}^2}}$$

The formula in the first column on page 208 should be replaced by this equation:

$$r_{13.4} = \frac{r_{13} - r_{14}\,r_{34}}{\sqrt{1 - r_{14}^2}\,\sqrt{1 - r_{34}^2}}$$

and the equation in the second column on the same page by the following:

$$r_{12.34} = \frac{r_{12.3} - r_{14.3}\,r_{24.3}}{\sqrt{1 - r_{14.3}^2}\,\sqrt{1 - r_{24.3}^2}}$$

Shop Conduct for Success

1. BE ON TIME. Time lost can never be regained.
2. BE ATTENTIVE. There is no such thing as "I don't know". The information is available. Use your head. Think. Ask questions. Watch the instructor. Read assignments.
3. BE COURTEOUS. It not only makes you feel better but it is right.
4. BE CAREEUL. If you notice anything which does not seem to be as it should, inform your instructor at once.
5. BE CLEAN. Our work is greasy but it is not dirty. Provide yourself with soap and towels, and use them. Wear coveralls and a shop cap. These will protect your other clothing and add to the appearance of the shop.
6. BE CHEERFUL. Everyone admires a happy disposition.
7. BE STEADY. Every day brings something new and different. Be on the job. When you are absent you miss instruction that can never be made up. You must either PASS or FAIL.
8. BE PROUD. Do your job better than anyone else can do it. Keep your bench and tools clean, orderly, and in good condition.
9. BE A MAN. Treat the other fellow as you wish to be treated. Think it over. No one likes a vulgar act.
10. BE FAITHFUL. Can you be trusted to do the things you are asked to do? Think it over. When you are given a job, you know it is because there is something of benefiit to you in the doing of that work.

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Submitted by Albert G. Bauersfeld, Chicago, Illinois

Poster 40 September, 1931

General Safety Rules

For the Protection of all Pupils

A careful operator protects himself and others from danger in a school shop by complying with the following rules:

1. Learn thoroughly the safety rules governing the operation of a machine before you use it. Power machines are to be used only when the instructor is in the room, and with his special permission each time a machine is used.

2. Only one pupil should be working at a power machine at one time. All other pupils should wait their turn to use a machine at a safe distance and refrain from conversation with the pupil who is operating a power machine.

3. If a machine is out of order, call your instructor rather than to leave the machine with adjustments loose, which may cause an accident to the next pupil using this machine.

4. Stop any machine from running before attempting to oil, to adjust, or to set up work on this machine.

5. Proper guards are provided for every machine. See that the guards are in place and in working order before you turn on the power.

6. Overalls, jackets, and work aprons are close-fitting clothes which will not easily get caught in the moving parts of a machine. Provide yourself with such an outfit, and wear it. Be sure that the sleeves of your jacket are tightly buttoned up or turned up at the elbow, and that your tie is tucked into your shirt so that there are no loose ends of clothing to be caught.

7. Use a switch lever or a belt pole to shift belts or to turn power on or off. Do not use your hand or a small stick to stop a machine, for it may get caught.

8. Refrain from playing pranks or scuffling with anyone in the shop. Attend strictly to business, which will minimize all danger from sharp tools and power machinery.

9. A dull tool is often more dangerous than a sharp one, because one must use so much added uncontrolled force. Only use a file when it has a handle.

10. Help keep debris from gathering around a power-driven machine. Sweep off with a brush-broom all surplus stock, when you are through using a machine.

11. Goggles should be worn to protect the eyes when using an emery wheel or pouring molten metal; also remove jewelry from your hands before operating a machine or working with hot metal.

12. CULTIVATE PERSONAL CAUTION AT ALL TIMES; this is one of the big lessons to be learned in shopwork.

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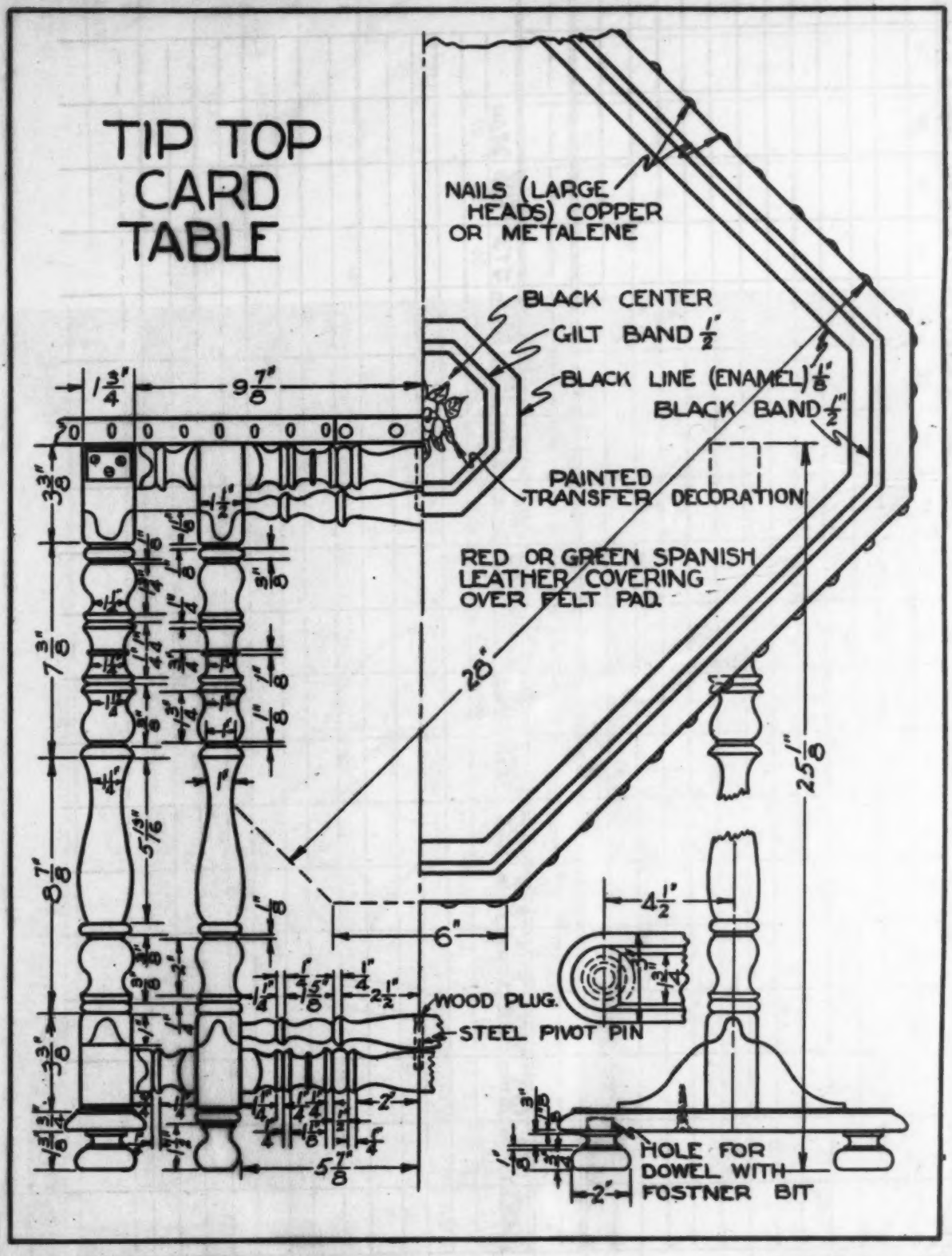
TIP TOP CARD TABLE



Designed by R. M. Hamms, Council Bluffs, Iowa

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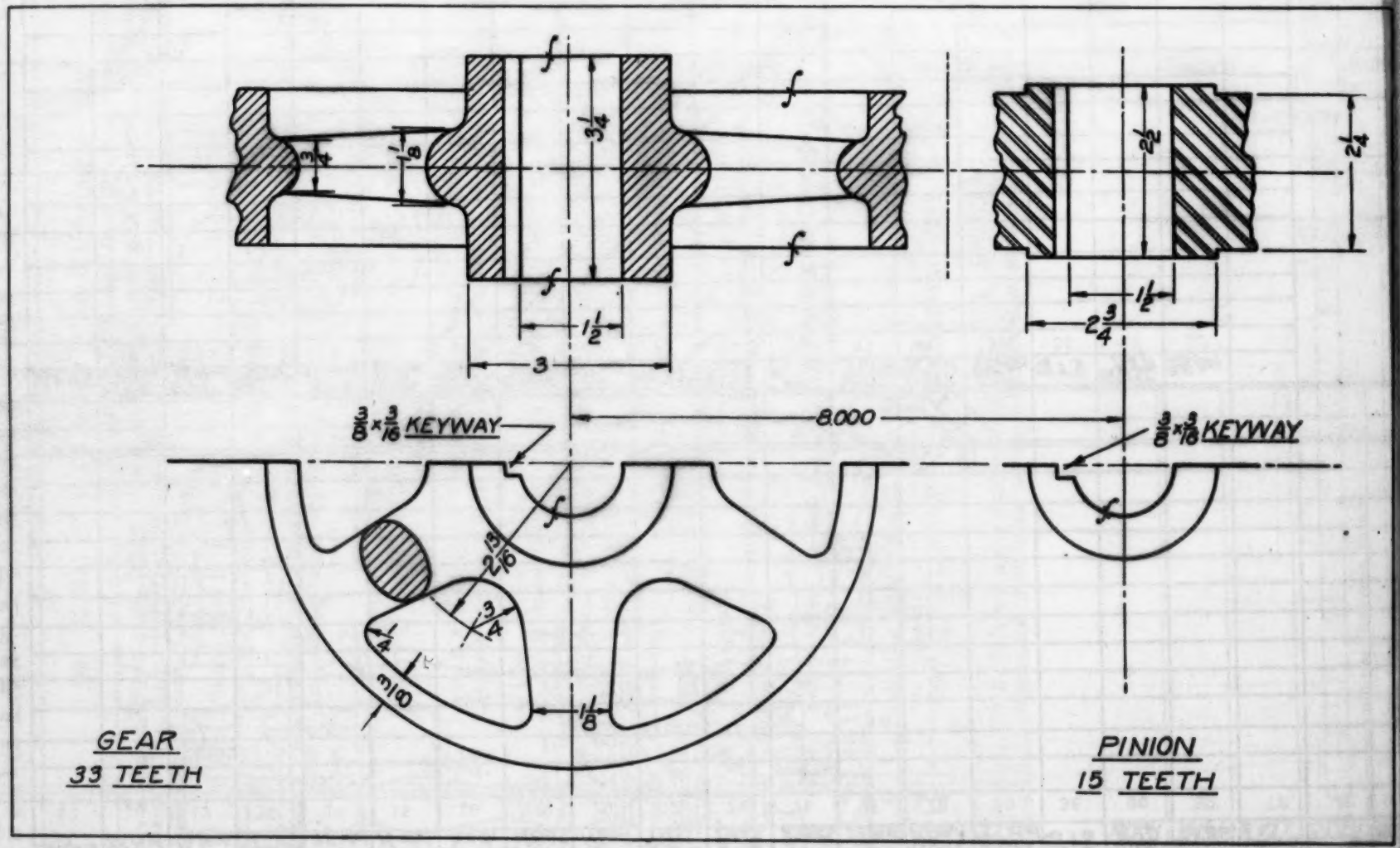

GEAR
33 TEETH

PINION
15 TEETH

Spur-Gear Problem, Submitted by William A. DeVette, Erie, Pa.

Described Elsewhere in This Issue

Spur-Gear Problem, Submitted by William A. DeVette, Erie, Pa.

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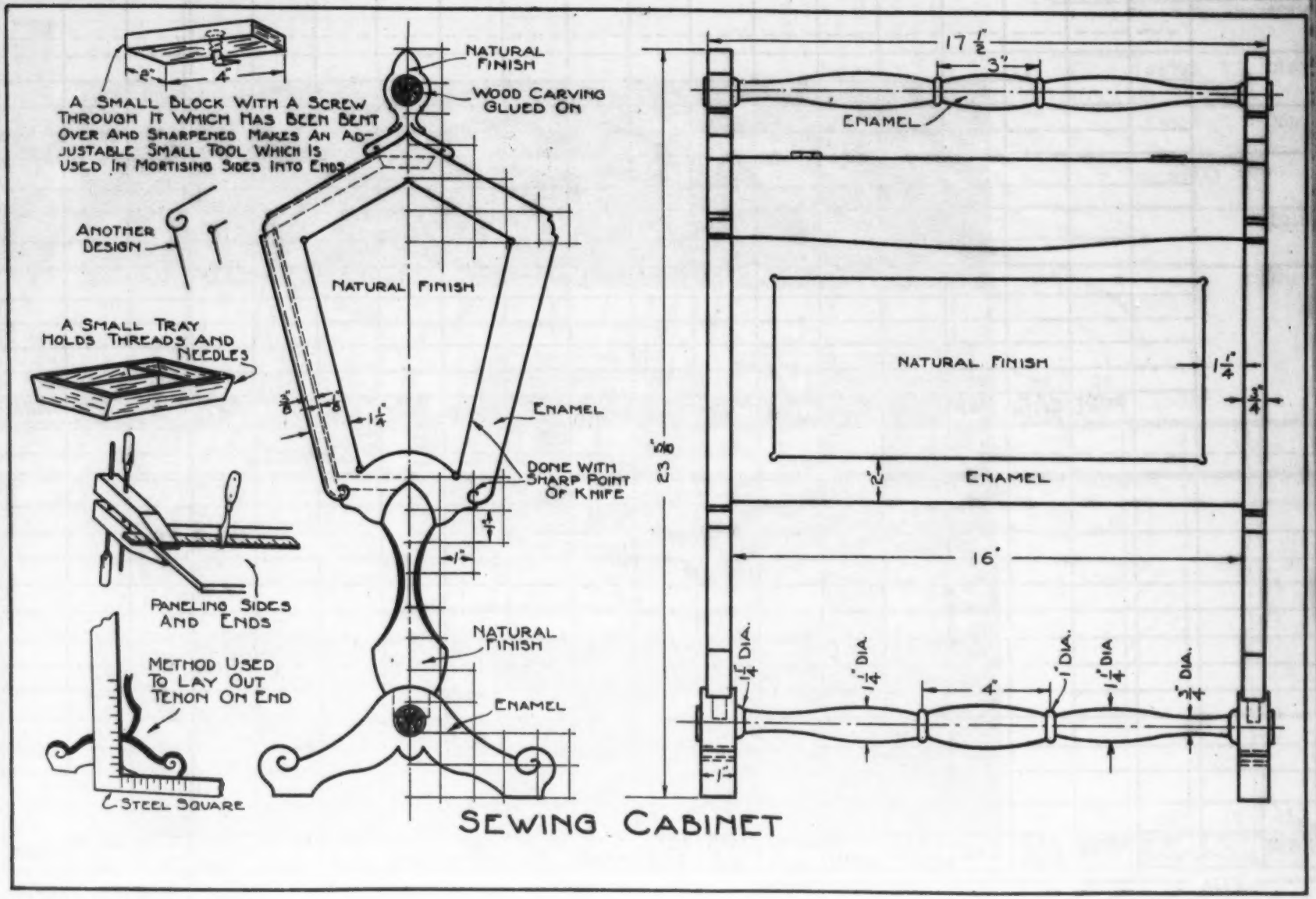

Designed by G. H. Silvius, Detroit, Mich.

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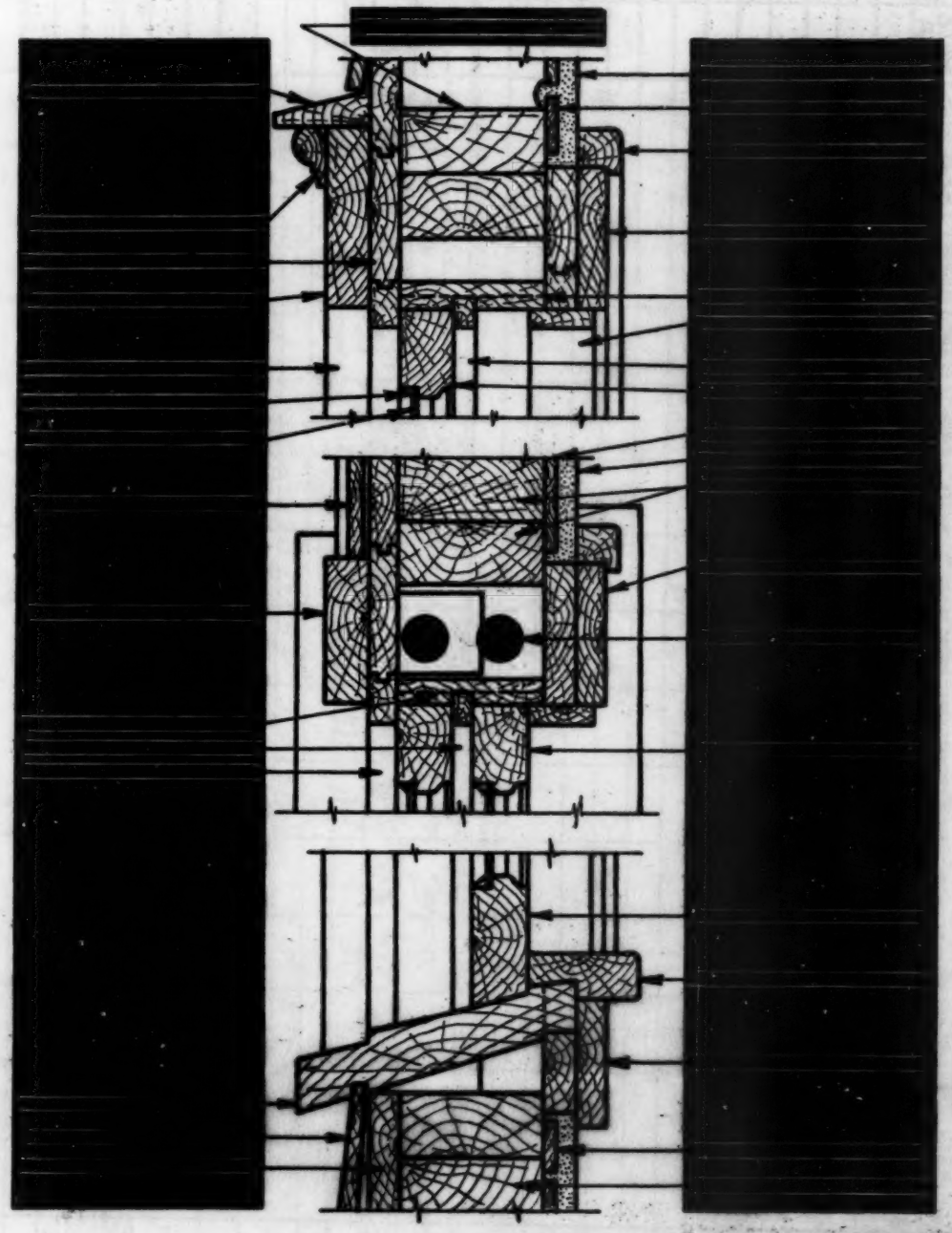
ARCHITECTURAL DRAWING.

TEST NO. 1

STUDENTS ARE TO FILL IN THE NAME OF EACH PART OF THE DOUBLE-HUNG WINDOW FRAME SHOWN BELOW. YOU WILL BE GRADED ON NEATNESS, LETTERING AND ACCURACY.



STUDENT'S NAME [redacted]

Submitted by Ren Aton, Michigan City, Ind.

PROBLEMS AND PROJECTS

TIP-TOP CARD TABLE

R. M. Hammes, Abraham Lincoln High School, Council Bluffs, Iowa

(See Supplement No. 219)

Designed as a gift, this bridge table proved so popular that twenty could have been disposed of immediately if they had been for sale. The padded-leather top affords a fine playing surface. The leather may be decorated in many ways but it is rich-looking when left plain. The suggested decoration is quite simple.

A table of this type is much more rigid than the standard card table and the cost is between three and five dollars depending upon the kinds of material used.

A SPUR-GEAR PROBLEM

William A. De Vette, Wilson Junior High School, Erie, Pennsylvania

(See Supplement No. 220)

This is a drafting-room problem.

Draw a pair of spur gears, using the following information:

Distance between centers	8.000 in.
Speed ratio	11 to 5
Diametral pitch	3
Width of face	2¼ in.

For details and dimensions for hubs, arms, etc., see the Supplement.

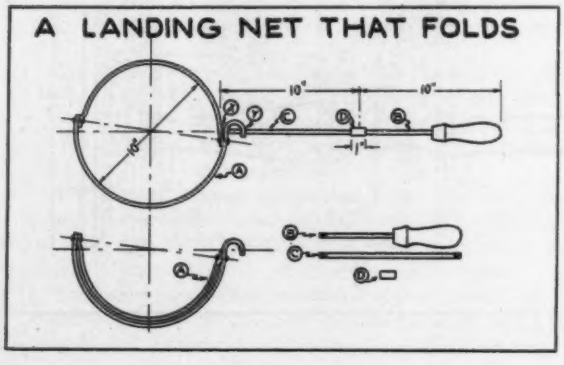
Place all calculations that have to be made on the back of the drawing.

A COLLAPSIBLE LANDING NET
A Metal-Shop Project

Charles M. Rice, North Junior High School, Everett, Washington

This project was made by C. S. Jones, an industrial-arts instructor who likes to hike into the hills and fish in the hidden mountain lakes. The ordinary landing net was found to be too cumbrous for climbing over rocks and through thickets, so a folding net, one that can be carried in the pocket, was evolved.

The few operations in the construction of the landing net, coupled with its useful nature, suggests a practical project for the metal shop. The two sections of the hoop A, which are bent from strap metal ⅛ in. wide, are drilled and tapped to receive the handle at X, while the extended hooklike brace has a ¼-in. hole at Y. The handle B is made from a length of ¼-in. rod stock, fitted with a file handle and threaded at the other end. Section C is an extension for the handle (if one is desired), and is joined to section B with a short length of ⅜-in. cold-rolled steel, drilled and tapped to receive the handle sections.



COLLAPSIBLE LANDING NET

A net may be made from linen thread, thus providing a lesson in netmaking, or that article may be purchased ready-made and threaded over the two sections of the hoop before they are joined together with rivets.

LAMPS

F. E. Hardin, Manual Training High School, Peoria, Illinois

Floor and table lamps are still in vogue, hence they may be considered as good projects for students of woodworking. They are highly desirable from the standpoint of the home, and also for the elasticity of design which makes it possible to suit the project to the individual boy's ability with the assurance that there will be something worth while when the job is completed.

This project also is helpful in using up small pieces of gumwood, walnut, and mahogany which otherwise would go to waste.

All material for lamps should have the central pieces for the standards grooved in the center with a ¼-in. groover, to produce a channel for the lamp cord. After the two halves are matched and glued, the ends of this groove should be plugged so the material for the standard may be centered on the lathe. The turning completed, these plugs should be removed with a ⅜-in. bit, leaving a hole through which the wire may be passed. On one end is to be fitted a piece of ⅛-in. nipple, 1½ to 2 in. long, with a running thread upon which the electric-light fixture is mounted.

The bases should be made of glued-up stock varying in thickness according to the material available, to prevent warping, which is very apt to occur if the bases are made of a single piece.

The standards of the floor lamps are to be made in four sections in order that they may be turned on an ordinary lathe

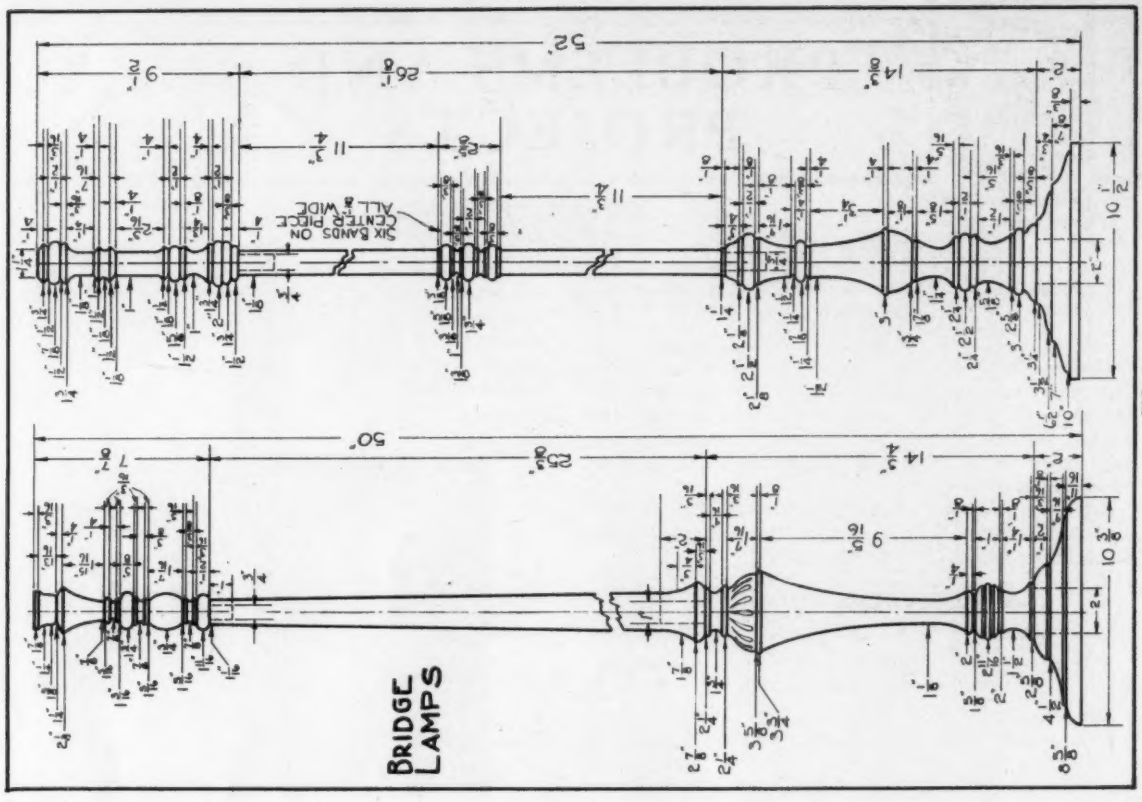

BRIDGE LAMPS
SIX BANDS ON CENTER PIECE ALL 3/4" WIDE

FIG. 2

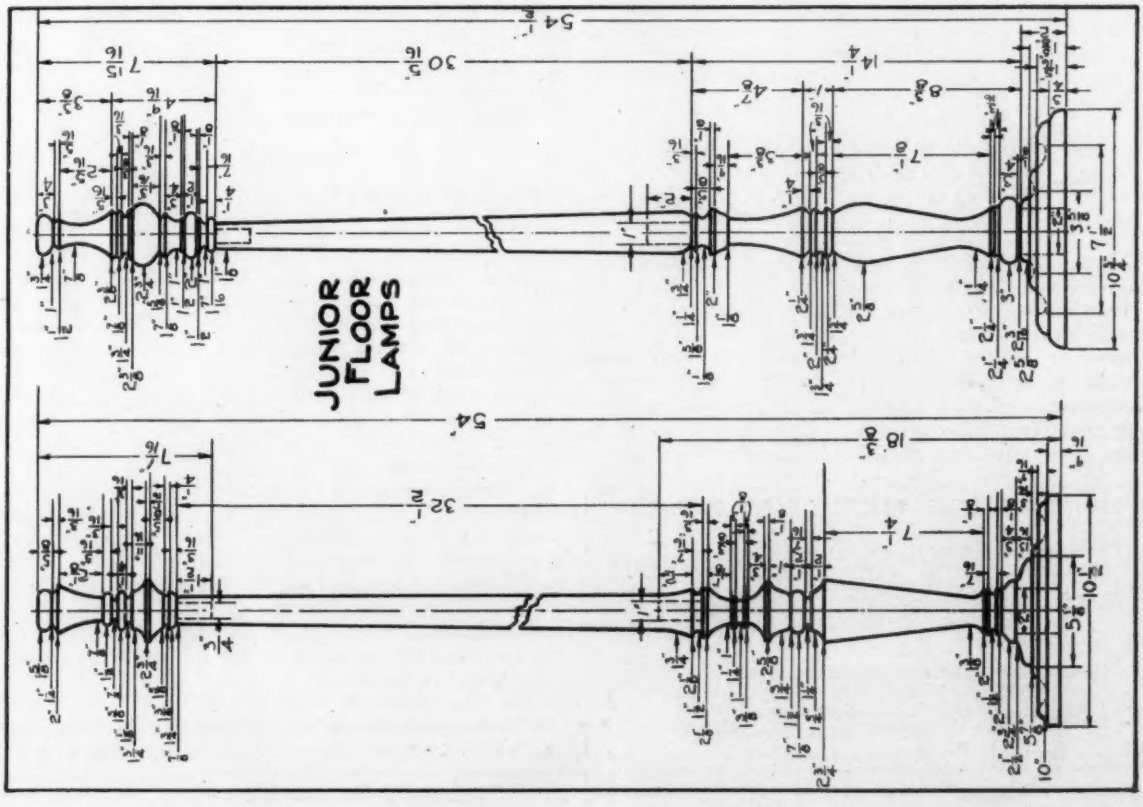

JUNIOR FLOOR LAMPS

FIG. 1

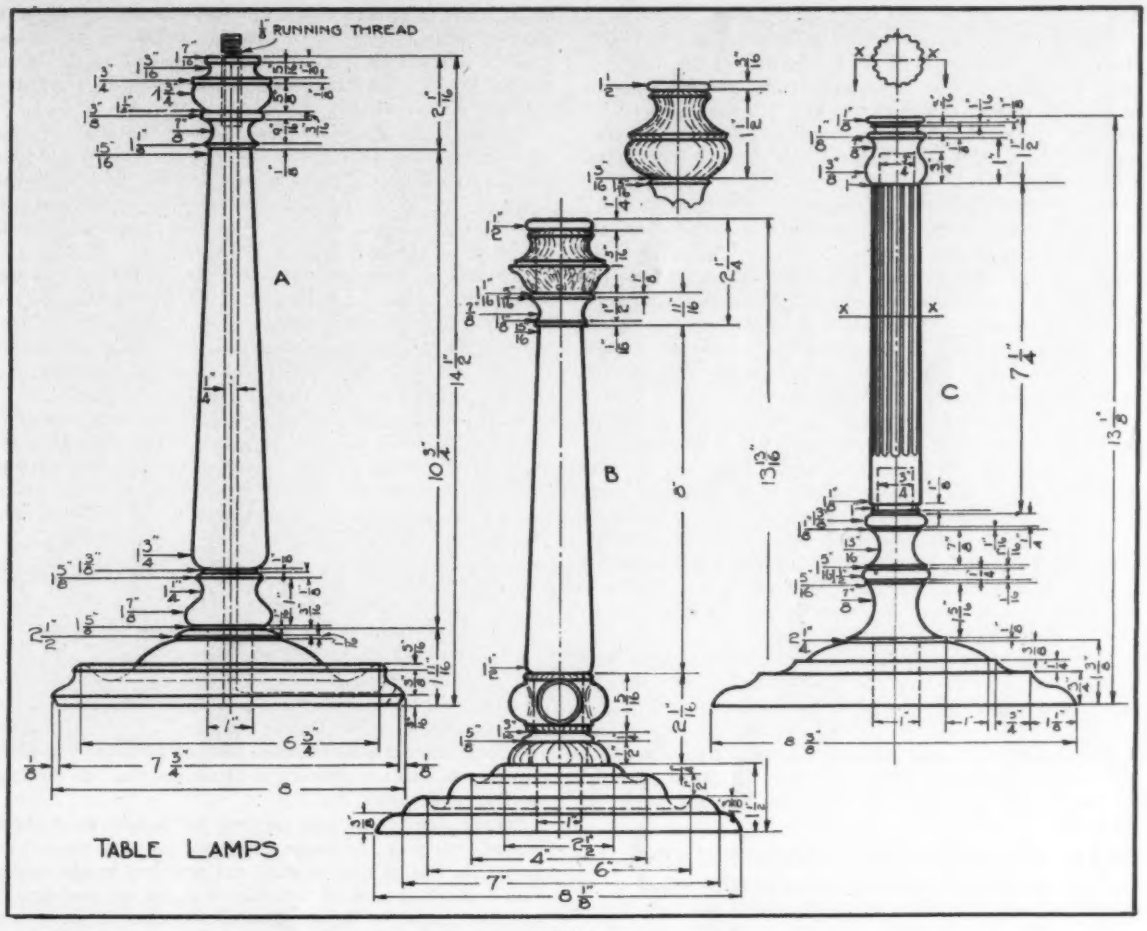


FIG. 3

and also to prevent excessive vibration which occurs in turning long lengths. Dowels are left on one end of each piece, while the other end is bored with a Forstner bit, held in a chuck in the lathe, of the same size as the diameter of the dowel to be inserted.

The bases are turned on faceplates. First, the stock is mounted upside down. It is then trued up and a dovetailed recess turned in, which may be filled with lead later to give more weight and stability to the completed job. The stock is then reversed and the base shaped. Careful selection and use of screws is necessary in order that the screw holes do not show when the base is completed.

The designs shown in Figures 1 and 2 may be used as either bridge or junior floor lamps, the only change being in the length of the shafts. They may be made plain or with a little touch of hand carving, the latter adding variety. This carving may, however, be a little difficult for the boy of only average ability.

The table lamps shown in Figure 3 are made in two pieces, a shaft and a base. When, however, fluting is to be done, as shown at C, the plain shaft must be made separate in order to run the flutes. This latter operation may be accomplished with a small, power, hand shaper.

The pressed ornaments shown at B were procured from a company specializing in this type of work. The ornaments are fastened with brads and glued to a plain-turned shaft. They make the lamp attractive, yet are very easily applied.

The lamps may be finished with a coat of stain, filler, two coats of thin shellac, two coats of glossy varnish, and a final coat of dull varnish.

THE SOLDERING OF ALLEGHENY METAL[1]

Kenneth T. MacGill, Chicago, Illinois

Allegheny metal is one of the so-called stainless steels. It consists of a chrome-nickel-iron alloy containing approximately 18 per cent chrome, 8 per cent nickel, and small amounts of manganese and silicon. With its introduction into industry the problem of soldering it has come up. While the process of joining this type of metal may seem somewhat difficult to one who attempts it for the first time, nevertheless, Allegheny steel can be soldered quite easily and soldered joints have shown a strength of as high as 8,000 pounds per square-inch intension.

A knowledge of the physical properties of both Allegheny steel and solder is helpful in overcoming any difficulty that might be experienced in soldering this metal. Some of the properties which make this metal so desirable for use are its resistance to chemical action and its low ratio of thermal conductivity. These are directly opposed to the properties which make ordinary soldering simple and effective.

METHOD OF SOLDERING ALLEGHENY METAL

Greater strength in the soldered joint will be obtained if a fillet is formed on the back of the seam, as well as at the front, as shown in the illustration. To obtain full penetration,

[1]The name of the manufacturer of Allegheny Metal, and the special solder and flux used for soldering it, will be furnished on request.

it is necessary that the full width of the seam be heated to a point above the complete liquidation point of the solder. Due to the slowness with which Allegheny metal conducts heat, it is obvious that in soldering, where ordinary grades of solder are used, either greater heat must be used, or the travel of the soldering iron slackened, to give sufficient time for the full width of the seam to attain the proper temperature.

Both these methods are objectionable, since they make the operator deviate from his usual practice, and unless the operator is skilled, the work is likely to be faulty. To overcome this difficulty, a special Allegheny solder has been developed, which gives greater strength than the ordinary solder, but which remains entirely liquid at lower temperatures, so that the ordinary soldering temperature is sufficient to heat the seam to a point where the new solders will penetrate the seam and form a fillet on the reverse side.

To obtain good results, it is necessary that the part to be soldered be free from oxide and grease which would prevent the solder from adhering. Due to the high resistance of Allegheny metal to chemical corrosion, the ordinary fluxes will not properly etch the surface, so that it was necessary to prepare a special flux in order to accomplish the desired result. This flux acid has a tendency to attack the Allegheny metal, hence, when the job is completed, it is advisable to wash all surfaces with a soap or soda solution in order that the finish of the metal may not be spoiled.

Numerous soldering tests have shown that a joint with 1/64 in. of solder between the surfaces has greater strength than a job where the surfaces are sweated together. If it is necessary to clamp the two surfaces to be soldered together, it is advisable that a thin spacer or a slight crimp be put in the metal at the point where the clamp is spaced, in order to insure sufficient space for both the flux and solder to penetrate.

ELEMENTS OF JOB COMPOSITION—V

Frank P. Rich, Roxbury Memorial High School, Boston, Massachusetts

Aims of Display

Display in printing has two definite aims — to interpret and to attract.

1. *Display Should Interpret.* Display is used properly when it makes clear the thought or message intended for the reader.

There must be a clean and orderly arrangement of the display to enable the reader to grasp the message at a glance. Avoid complicated arrangements that are hard to grasp; make it easy for the reader to follow you step by step. Avoid too much display. To attempt to display a great many lines is to display none.

2. *Display Should Attract.* Printing must attract the eye by its good looks. The printed page should be made attractive by a careful choice of type and by its pleasing arrangement.

Embellish your type pages with appropriate ornaments, rules, or borders if it will help the effect of what you are saying, if it will be good to look at and invite attention; but don't use decoration merely for the sake of ornamentation or because it will add something supposedly artistic to the form. Borders, rules, and ornaments should merely add tone and give an inviting appearance.

Simplicity and good judgment in the setting and arrangement of the lines to be given prominence, then, are the first points of good display printing. See that the type says what it has to say, clearly and distinctly and with proper emphasis, and when that is assured — and not until then — give it all the grace, beauty, and distinction that you can.

The laws of typography show us that simplicity means the arrangement of lines and masses into as few groups as possible. Lines of varying length and strength constitute groups in themselves and consequently distinct forces of attraction. Gather the type in as few groups as possible instead of breaking it up into any number of spots so as to fill a given space.

As a usual thing, we read display printing by lines — one line at a time — and if there is to be any division between the various items or any part of the items which compose a group, it should be at the end of the item rather than in the center.

Note the difference in the arrangements of the items in Figure 1 and Figure 2.

BY-LAWS

CEDAR LODGE
NO. 1269 LOYAL ORDER
OF MOOSE, BOSTON
MASS.

Nineteen
Hundred and Twenty

Fig. 1
The items in the above page are poorly divided and are not easily understood.

BY-LAWS

CEDAR LODGE NO. 1269
Loyal Order of Moose
Boston, Mass.

Nineteen Hundred
and Twenty

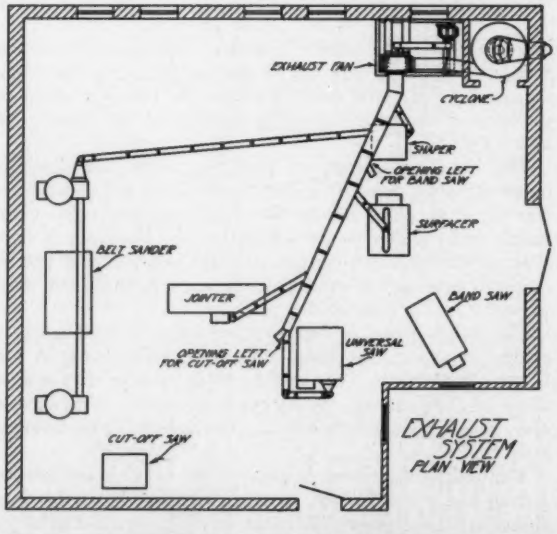
Fig. 2
The items arranged in separate lines. A more logical arrangement and more easily read.

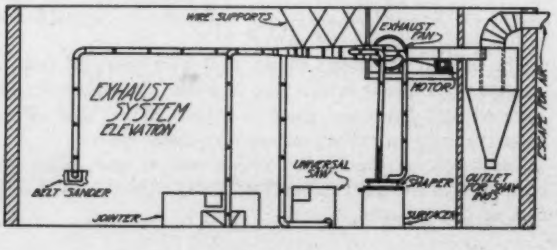
AN EXHAUST SYSTEM FOR THE WOODWORKING SHOP

L. D. Keaton, East Texas State Teachers College, Commerce, Texas

Our course in sheet-metal work consists of three terms, or one year. The first term of twelve weeks is devoted to sheet-metal pattern drafting. The second term of ten weeks is devoted to elementary sheet-metal-working practice. The third term of six weeks is devoted to larger projects, as cornices, ventilators, skylights, etc.

For the larger project for the term just passed, an overhead exhaust system for the woodworking machine shop was decided upon. The system was designed and sketched by the writer, who is the instructor of the class. Calculations and layouts were then made by the members of the class in sheet-metal





THE EXHAUST SYSTEM AFTER IT WAS INSTALLED

work under the direction of the teacher. After that the patterns, which had been drafted on heavy paper, were cut out, and then transferred to the metal. The system was constructed of No. 20 galvanized iron.

The work went forward at a rapid pace. The main pipe, or header, together with the smaller pipes running to the various machines and the hoods constituted the first unit of construction. This part, or unit, included all of the system on the intake side of the 33-in. exhaust fan. The piping was all made in 30-in. joints, because of the limited size of some of our sheet-metal-working machines.

Then the assembly began. From the fan to the various machines all joints were riveted and soldered to make this unit of the system as nearly air-tight as possible. It may be noted that as each pipe enters the main pipe, or header, reduction was made accordingly in cross-sectional area of the main pipe. This process continued throughout the system. The main pipe is 14 in. at the exhaust fan and tapers down to a Y of two 5-in. pipes. The main pipe is about 25 ft. long. The pipe to the shaper, the first machine served by the system, is 4 in. in diameter, while all the other pipes to the various machines are 5 in. in diameter, All hoods are so constructed that they may be removed for adjusting and repairing the machines. This constituted the first unit of the project.

The second unit of construction consisted in the building of a cyclone and outlet pipes to take care of the waste from all the woodworking machines. The patterns for the cyclone were laid out on the metal and cut directly from the metal. The top part of the cyclone is a drum 48 in. in diameter and 30 in. high. Inside this drum is a second drum about 22 in. in diameter and 26 in. high. Beneath the large drum is a large funnel which is 48 in. at the larger end and 8 in. at the other end. The funnel was laid out with a radius of 74½ in. The cyclone complete is 8 ft. 6 in. high. This cyclone was placed in an old elevator shaft in one corner of the woodworking shop.

The outlet from the fan is a square, 13 in. on the side. The square outlet changes to a rectangle 10 by 17 in. and then enters the large drum of cyclone at a tangent. Over the opening in the top of the cyclone is an elbow 24 in. in diameter at the drum and tapering to 17 in. in diameter where it reaches the outside of the building through a thimble in the brick wall.

The 33-in. exhaust fan runs 1,200 r.p.m. and the current of air and waste from the machine enters the cyclone at a high rate of speed. In this cyclone the air and waste are separated. The cyclone of air is broken up by a baffle in the lower end of the funnel. The current of air then passes through the top of the smaller drum then through the large elbow to the outside of the building. All the waste in the form of shavings and dust falls through the bottom end of the cyclone into a cotton sack tied over this end. The sack is removed by the janitor and the waste disposed of about once each day.

The system is a very successful and efficient one and it was constructed and installed at very little cost to the school. The fan was installed by a class in woodworking and the motor was installed by a class in metal working.

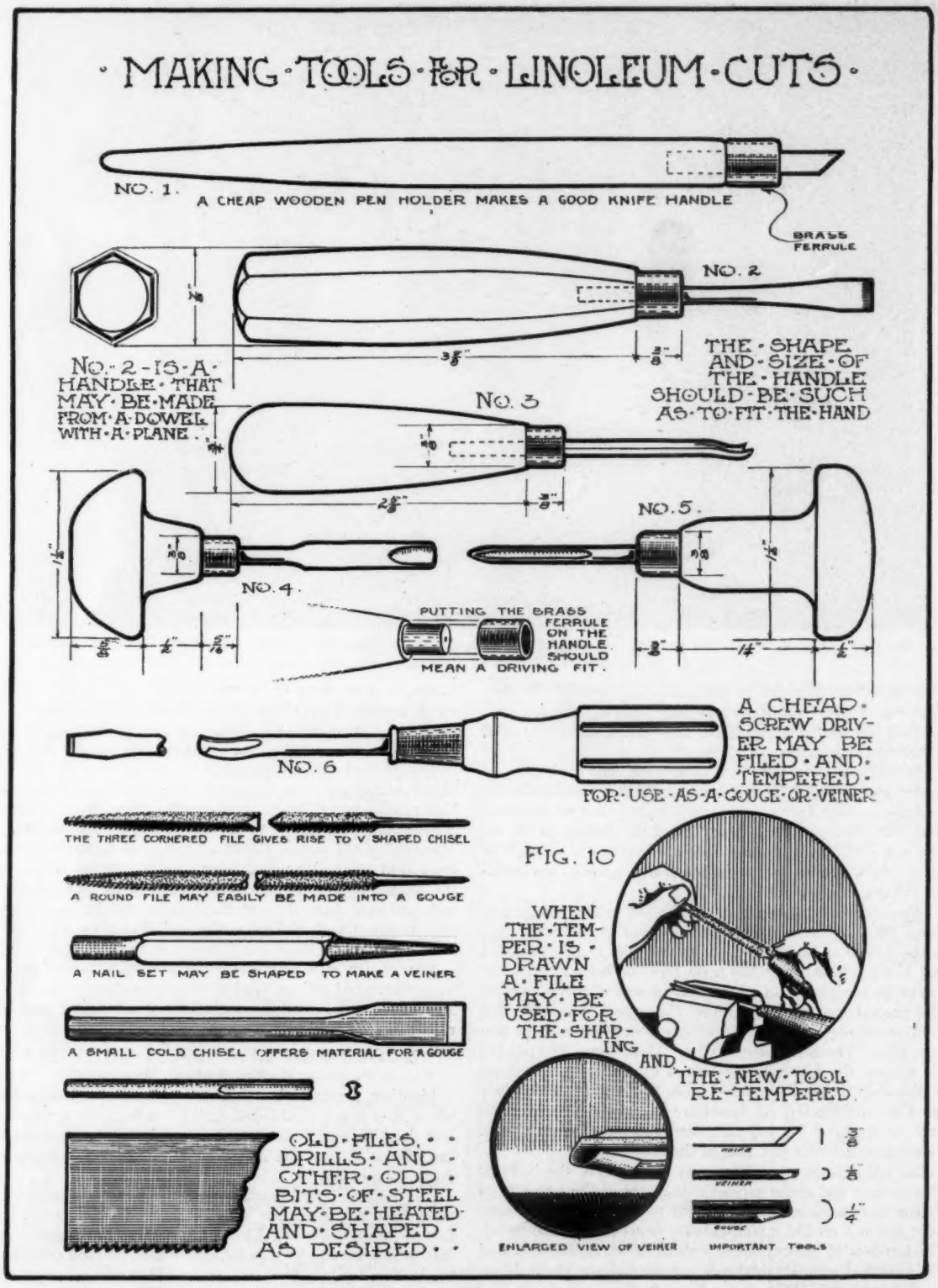
TOOLS FOR LINOLEUM CARVING

F. Clarke Hughes, Spokane, Washington

Linoleum carving has arrived at a point in its development where it is a well-established activity in both the elementary and the high school, because it is particularly susceptible to the efforts of even the inexperienced worker as a means of graphic expression.

The general instructional material and the equipment devices have not kept pace with the rapid movements in this line of interesting work. Linoleum carving, like "Topsy," has just grown up and as a result many teachers and craftsmen are looking for help from any source. The questions most frequently asked about the work are, "What do you use for tools?" or "What kind of tools do you use?" or again, "Where do you get your tools?"

As a matter of fact, very few tools are needed for linoleum carving, and the material being soft and without grain the tools do not have to be sharpened to as fine an edge as for wood carving. A number of supply houses are now advertising these linoleum tools, put up in sets of six or eight tools each.


MAKING TOOLS FOR LINOLEUM CUTS
NO. 1.
A CHEAP WOODEN PEN HOLDER MAKES A GOOD KNIFE HANDLE
BRASS FERRULE
NO. 2
NO. 2 IS A HANDLE THAT MAY BE MADE FROM A DOWEL WITH A PLANE.
THE SHAPE AND SIZE OF THE HANDLE SHOULD BE SUCH AS TO FIT THE HAND
NO. 3
NO. 4.
NO. 5.
PUTTING THE BRASS FERRULE ON THE HANDLE SHOULD MEAN A DRIVING FIT.
NO. 6
A CHEAP SCREW DRIVER MAY BE FILED AND TEMPERED FOR USE AS A GOUGE OR VEINER
THE THREE CORNERED FILE GIVES RISE TO V SHAPED CHISEL
A ROUND FILE MAY EASILY BE MADE INTO A GOUGE
A NAIL SET MAY BE SHAPED TO MAKE A VEINER
A SMALL COLD CHISEL OFFERS MATERIAL FOR A GOUGE
OLD FILES, DRILLS AND OTHER ODD BITS OF STEEL MAY BE HEATED AND SHAPED AS DESIRED
FIG. 10
WHEN THE TEMPER IS DRAWN A FILE MAY BE USED FOR THE SHAPING AND THE NEW TOOL RE-TEMPERED
ENLARGED VIEW OF VEINER
KNIFE
VEINER
GOUGE
IMPORTANT TOOLS

About two or three well-selected tools are better than a wide range of sizes and shapes. Too many tools always tend to increase the equipment worries without any compensating efficiency.

Frequently the making of a linoleum block requires a special size of tool not to be found in any supply catalog. Workmen or craftsmen in any line of work have their own pet tools that just fit their own needs and ideas better than any others, and the students in school are no exception to this rule after they have made a few linoleum blocks. For this reason many workers prefer to shape and make at least some of their own tools for this carving.

The author has found that with a little help and a few suggestions, high-school students are able to do very creditable work in this kind of toolmaking.

If the handles are turned in the form of a long rod of successive handles all fastened together, they may be cut apart and finished as needed. The handles may be turned by the industrial-arts department, using as a guide the more popular shapes that for hundreds of years have been used by master carvers. The size of these handles should always be suited to the size of the hand that uses them.

The brass ferrules may be made from old empty cartridge shells or any other form of tubing. However, they should be put in place with a driving fit and all the edges smoothed.

Perhaps the most widely used tool for the linoleum carving is the skew-shaped knife similar to the one shown in No. 1 of the accompanying illustration. In this case the tool is made by driving a thin piece of steel into a slender handle, made by sawing off the hollow end of an old penholder and putting a ferrule on the solid section. This is an ideal tool for small work, because it can be rotated between the fingers in cutting around small curves. The angle at the end of the blade should be about 30 degrees. The width should be about ¼ or 3/16 in. for average work.

The ordinary mat knife with the loose blade or any other knife with a sharp-pointed blade may be used for most of the straight and plain cutting, but the clumsy form of the handle makes easy turning impossible.

One of the most indispensable tools for linoleum work is the gouge, used for taking out the backgrounds. The gouge may be shaped from a number of different odd-shaped tools as shown in the accompanying illustrations. Frequently wood-working and metal-working tools are discarded because they are broken, and are no longer useful in their original capacities, but the steel in them may be used for making tools and gouges for linoleum carving.

In many cases these discarded tools have their own handles, as is the case of the screw driver shown in No. 6. If the hardness of the metal makes filing or shaping difficult the end may be softened by holding it in a gas flame or torch until it is red and then allowing it to cool gradually. After it has been properly shaped, it may again be hardened by heating it to a cherry-red color and plunging it into cold water or oil. A few experiments will determine just the right heat and the correct time for cooling to secure the proper temper for the edge of the tools.

The veiner is a very small gouge and is valuable for certain kinds of work. Frequently a good veiner may be shaped from a nail set or a section of a gimlet bit. Odd bits of tool steel also can be used when one begins to make up some of these special carving tools, and the possibilities are unlimited to the resourceful teacher and student.

TABLE

Carl v. Lindeman, Training Unit, Western State Teachers College, Paw Paw, Michigan

A project such as that shown in the illustration which accompanies this article is always welcomed by the average manual-training instructor, as it is one that will fulfill the requirements for a table that may be used as a radio table, a night table, flower stand, sewing cabinet, or for other uses.

The legs are tapered on the band saw, leaving the knob at the bottom of the leg. The sides and back are made of ¼-in.

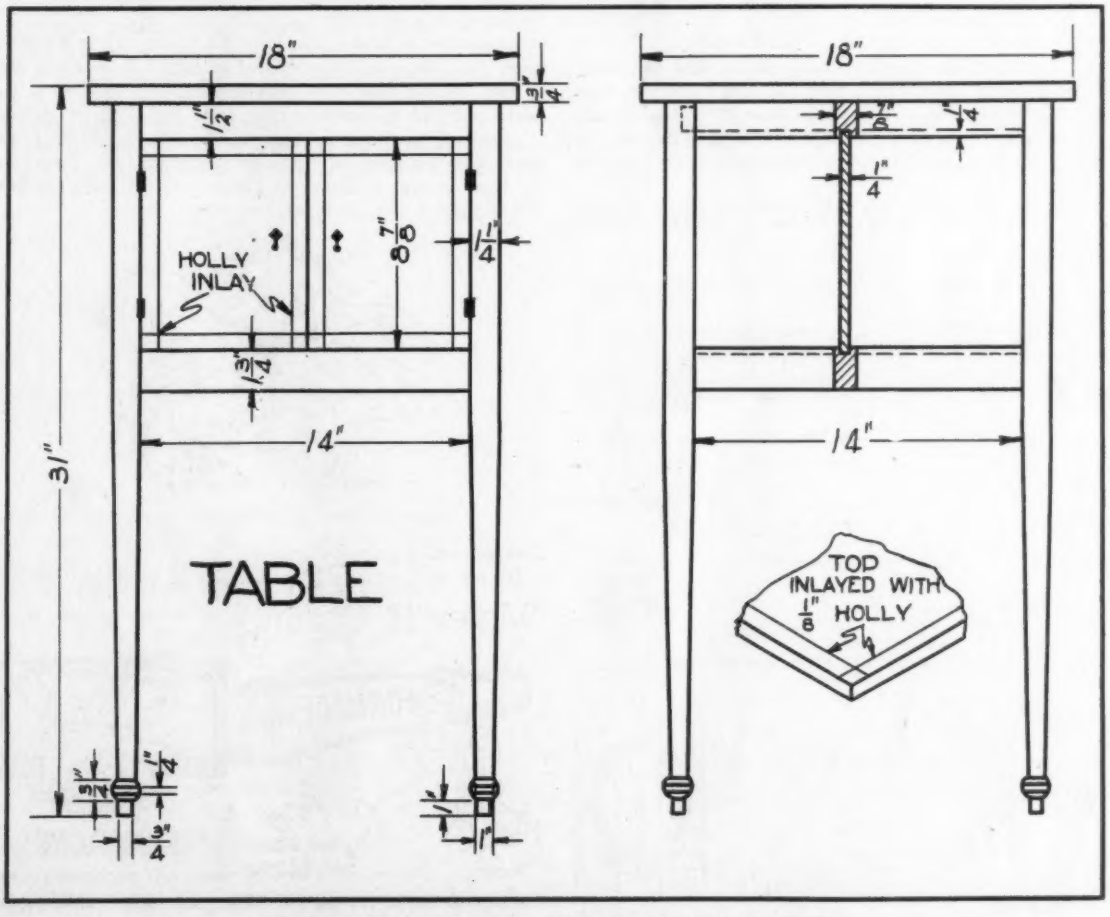


TABLE DESIGNED BY CARL v. LINDEMAN, PAW PAW, MICHIGAN

paneling, veneered on one side. The doors and top are solid walnut inlayed with ⅛-in. holly in the design shown in the drawing. To most pupils, inlay work is something new and different, and it has an attraction that ordinary shopwork does not have. From an educational standpoint, it has excellent qualities. It calls for very careful surfacing of stock, teaches design, and gives practice in the use of the marking gauge and the cabinet scraper. By using inlay work, the finished project becomes a thing of beauty that is sure to bring praise and admiration.

The project, after being completed, may be filled with a natural paste filler. The oil in the filler will bring out the grain and give the walnut a darker finish. Several coats of shellac and varnish may be applied and rubbed down with pumice stone. If the project is to be stained, care must be taken to give the inlay a coat of shellac before the stain is applied.

Jobs to be Done in September

J. H. Dillon, Junior High School, Bloomington, Indiana

Editor's Note: **While the jobs outlined here may have to be deferred until later in the season in some localities, nevertheless Mr. Dillon's method of making his school shopwork function in the home is worthy of emulation. He issues these bulletins (of which the one here shown is the first) in mimeographed form to his pupils. They act both as an incentive and as a reminder.**

Drying Out and Putting Away the Garden Hose

Why do some people use the same garden hose for many years while others must buy a new one about every two or three years? Because some give proper care to the hose during the winter, and others do not. A hose that is taken in from the yard and piled down in a corner will last only about one year and its owner will be in the same fix as the boy in Figure 1, when the hose is again to be used in spring. The proper way to care for the hose is to take it apart into sections at the joints and pull the sections over some high limb or support of some kind, as shown in Figure 2. The hose should hang over the support for a day or two to get thoroughly dry. Then hang the hose on pegs as shown in Figure 3 or place it on a hose reel and put it away in a dry, cool place.

FIG. 1

THIS BOY PILED THE HOSE IN A CORNER OF THE GARAGE LAST FALL

FIG. 2

HANG THE HOSE UP TO DRY BEFORE STORING IT

THE HOSE HUNG AWAY PROPERLY

FIG. 3

Cleaning and Repairing Furnace

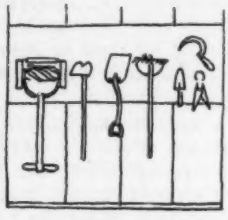
Do not wait until cold weather sets in before getting your furnace in shape for winter. There are some simple repairs and jobs that boys can do. The ashes should all be removed

PIPE COVERING THAT NEEDS REPAIRING

from the furnace. It is better to carry ashes out now than when it is cold and snowing. Clean out the soot from the upper part of the furnace and from the smoke pipe that runs to the flue. A small cedar bush tied to a pole or a wire makes a good brush for cleaning out pipes. All dirt and dust should be cleaned from the top of the furnace pipes. It is not only unsightly, but it is a fire hazard. If the insulation is off the furnace or heat pipes, you can get sheet asbestos cloth from a sheet-metal shop or from a hardware store. You can also get cement or paste, and straps to go around the pipes, at the same time. Examine the smoke pipe and if it shows weak or broken places, call a furnace man and have it replaced. Broken parts of the furnace should also be repaired.

Cleaning and Putting Away the Garden and Yard Tools

Are you proud of a dirty and rusty shovel or hoe hanging in your basement or garage? As soon as your last job with the hoe, spade, lawn mower, etc., is finished, clean off all dirt and



GARDEN TOOLS HUNG AWAY IN READINESS FOR NEXT SPRING

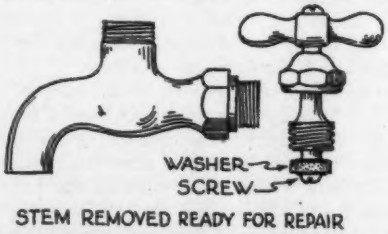
rust with a scraper and sandpaper. When clean and bright, give them a coat of heavy grease. Hang the tools in a dry place that is out of the way and where there is no danger of them falling on anyone.

Repairing Leaky Water Faucets

This job may have to be done any time during the year, but when you start a fire in the furnace and keep a tank of hot

KEEP REPAIR BILLS DOWN

water all the time, the hot-water faucets may leak under the added pressure. Test out and examine all the faucet washers, if they are worn, replace them with new ones. In some homes each faucet has a separate valve for shutting off the

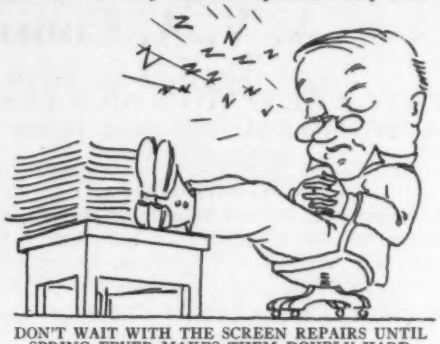


STEM REMOVED READY FOR REPAIR

water; in others the entire system must be shut off with one valve which usually is located near the meter.

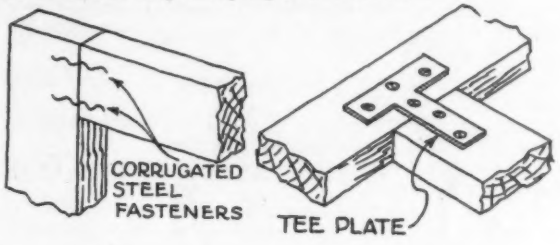
Removing and Storing Window and Door Screens

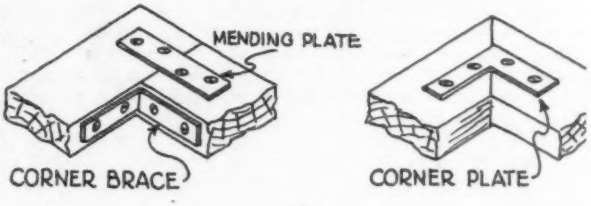
The first thing to do when storing screens is to number or mark each one so they can be replaced easily next spring.



DON'T WAIT WITH THE SCREEN REPAIRS UNTIL SPRING FEVER MAKES THEM DOUBLY HARD

Store the screens in a dry place where they will lie flat and where there is no danger of other things being thrown on top of them. The hinges of the screen doors should be left on the screen door and the screws tied up in a sack and tied to one of the doors, also keep the spring tied to the door.





If any of the screen frames are loose or broken, repair them with angle braces or corrugated fasteners as shown in Figures 4, 5, and 6. Repair the frames in the fall but do not renew the wire screen until spring.

After having used tools anywhere about the house, each tool, just as soon as the job is finished, ought to remind you of the following:

RETURN ALL TOOLS TO THE SHOP

A Coöperative Study Fostered by the A. V. A. Committee on Standards

PART VI—A TENTATIVE ANALYSIS OF AUTO MECHANICS FOR HIGH SCHOOLS

R. W. Selvidge*

The complete plan for this coöperative analysis was set forth in detail on page 189 of the May, 1931, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. The summary is here repeated for the information of those who did not have an opportunity to read the complete statement of the plan.

Summary of the Plan

In order to coördinate the efforts of a great number of teachers who are engaged in attempts to analyze the various industrial-arts subjects and the skilled trades for the learning units involved, the following plan is proposed:

How the Individual Shop Teacher Can Help

On account of the importance of such an analysis as a basis of effective teaching the following plan for coöperative effort is proposed.

1. Every teacher who is interested in such an analysis should join in this undertaking.
2. All industrial-arts subjects, as taught in the high school, are to be analyzed, for the learning units involved.
3. That the principal skilled trades are to be analyzed for the learning units involved.
4. Tentative analyses of the selected subjects, or trades, are to be published and distributed as rapidly as may seem practicable.
5. Any shop teacher or supervisor who is willing to coöperate, or to offer suggestions in the way of modifying, adding to, or taking from, the original list, should send such suggestions or comments to R. W. Selvidge, University of Missouri, Columbia, Mo., or to William T. Bawden, Peoria, Ill., chairman of the committee.
6. Suggestions thus received should be carefully studied, edited, and incorporated, as far as possible, into the original lists, and the revised lists published, together with the names of those who coöperate.
7. Those who are interested should send in the analysis of any subject, or trade, which they have prepared, and which may be used by the committee as the basis of the preliminary analysis. This form of coöperation will be of great value in getting more satisfactory preliminary lists of units.

In order to get the project started, a tentative analysis of auto mechanics follows. Those who are interested in coöperating in this matter are asked to study this outline with the view of adding to it anything that should be taught which is not in the list and striking out anything which should not be taught. Teachers should feel free to change the wording of any item to make it more definite, or more inclusive, or more exclusive.

In the study of the tentative analysis the best plan for the teacher is to take some of the jobs which he is using in his shop and analyze them with regard to this list of learning units. Perhaps the easiest way of doing this is to place the learning units in a vertical column, the jobs in a horizontal column, and check each unit in the column in which the job appears. *There must be definite working drawings and specifications for each job, or a correct analysis is impossible.* If it is found that the jobs contain learning units not in the list, such units should be added.

The Tentative Analysis of Auto Mechanics

There appear to be very wide differences of opinion as to what units of instruction should be included in a course of auto mechanics for high-school boys. Some hold that it should cover only the minor adjustments and care, while others would have the work cover major repairs. These differences of opinion arise out of lack of a common understanding as to the purposes of the work.

The primary purpose of a course in auto mechanics in the high school is not to teach boys to repair automobiles, as a vocation, but to teach them the fundamental mechanical principles involved in other machines as well as in the automobile. In addition, they are to be taught how the automobile operates, how to care for it, and how to make minor adjustments. When the instruction material is selected and organized on this basis, it will be seen that it offers an opportunity far beyond the mere making of repairs and adjustments; and pupils may study with profit the construction and operation of mechanical parts which it would be unwise for them to attempt to repair or adjust on a car.

The automobile is more widely used than any other machine, except, perhaps, the watch and the clock. It is important, therefore, that people know something of the principles on which the automobile operates in order that they may use it with greater satisfaction. Unfortunately, the automobile is more subject to defects in operation than the watch or clock; and for that reason the owner, or the prospective owner, should know something about the causes of the common failures, and how to care for the machine in order to prevent these failures as far as possible. Most cases of car failure during the first year or two are due to tinkering, or to failure to give the proper care to the car, because of a lack of understanding of the principles upon which it operates.

In some of our schools much time has been wasted in tinkering and making minor repairs when the time should have been used for a study of the fundamental principles of the machine. If the student is to be trained to use and care for the car intelligently, the instruction must be specific and systematic. In order to illustrate the fundamental things that are to be taught, the equipment must be sufficient and of the proper character. It should be permanent, and so arranged that it is available for instructional purposes with the least possible delay, and without any unnecessary, noninstructive labor. It should not be necessary for the teacher to depend upon friends or faculty members to furnish the material needed for instruction, whenever it is needed. If he must rely upon chance or accident to produce his instructional material, the supply will be irregular, time will be wasted, and the boys will be required to do a vast amount of work from which they receive no educational returns.

Schools are maintained for instructional purposes, and there is no virtue in doing a production job unless it contains the elements that are to be taught. Production jobs are highly desirable under certain conditions, but it is better to give time to experimental and practice work, which is known to contain the things that are to be taught, than to spend time on repetitive work in production jobs after the processes have been thoroughly learned. A "clinic" is highly desirable at times, but it should not be permitted to monopolize the time allotted for instruction in fundamental principles.

The fact must not be overlooked that in the study of this machine a boy will have an opportunity to learn a number of things of value which are not confined to the automobile in their application. This will justify far more extensive work on the automobile than would be justified on the basis of the care and operation of the machine alone. There are many fundamental mechanical principles involved, the applications of which are found in other machines, and the automobile offers an interesting opportunity for their study.

The list, as submitted, is not a list of the repairs a boy

*University of Missouri, Columbia, Missouri.

should be able to make, but a list of the experiences he should be given, in order that he may understand some of the fundamental principles of the automobile, how to care for it, and how to make minor repairs and adjustments. The list would be much shorter if it were confined to the repairs which a boy might be expected to make.

The Learning or Teaching Units

The things you should be able to do:

1. To plan the procedure in doing a job.
2. To test and clean spark plugs.
3. To clean and adjust breaker points.
4. To grease a car.
5. To change oil in the engine.
6. To wash and polish a car.
7. To iron out dents or bends in fenders or body.
8. To retouch scratches or damage to finish.
9. To repack water-pump glands.
10. To replace a water-manifold gasket.
11. To clean gasoline lines.
12. To replace light bulbs.
13. To test and adjust lights.
14. To adjust valve clearance in L-head motors.
15. To adjust valve clearance in valve-in-head motors.
16. To remove sediment from radiator.
17. To test and care for a battery.
18. To adjust tension on a fan belt.
19. To remove and replace a tire.
20. To repair puncture with cold patch.
21. To repair puncture with hot patch.
22. To insert boot in casing.
23. To align front wheels.
24. To inspect and adjust front-wheel bearing.
25. To test and correct lost motion in a steering mechanism.
26. To inspect and adjust a clutch.
27. To remove and inspect a floating rear axle.
28. To remove and inspect a semifloating axle.
29. To inspect and adjust the differential.
30. To adjust the mechanical brakes.
31. To adjust the hydraulic brakes.
32. To adjust main bearings.
33. To adjust connecting-rod bearings.
34. To scrape a bearing.
35. To time valves.
36. To grind valves.
37. To reface and reseat valves.
38. To trace lines of power from battery to engine for starting.
39. To trace lines of power from engine to battery for charging.
40. To trace lines of power from engine to distributor.
41. To trace lines of power from engine to wheels.
42. To inspect a vacuum tank.
43. To inspect a fuel pump.
44. To clean and adjust a carburetor.
45. To trace and test the lighting system.
46. To trace and test the ignition system.
47. To locate and repair a short circuit in the electrical system.
48. To locate an open circuit in the electrical system.
49. To test an ignition coil.
50. To change the charging rate of generator.
51. To clean commutator.

The things you should know:

1. The types and uses of antifriction bearings.
2. What is meant by *camber*, *caster*, and *toe-in*, and how they affect the operation of the car.
3. The principle of the worm gear and how it is applied to the steering gear.
4. How the cam-and-lever type of steering gear works.
5. How the planetary type of steering gear works.
6. The different types of clutches and how they work.
7. The universal joint and how it works.
8. How the gear-shift transmission works.
9. How the planetary transmission works.
10. How the free-wheeling device works.
11. How the differential works.
12. The meaning of gear ratio and its effect on power and speed.
13. The different types of axles.
14. The different types of brakes and the principal characteristics of each.
15. The types of engine bearings and the reasons for using such bearings.
16. The kinds of pistons, types of rings, their purposes and characteristics.
17. The meaning of cycle in a gas engine.
18. The sleeve-valve mechanism and how it works.
19. How the vacuum tank works.
20. How the fuel pump works.
21. The purpose of the carburetor and how it works.
22. The necessity for proper lubrication and how it is accomplished.
23. How the starting system works.
24. How the lighting system works.
25. How the ignition system works.
26. Safety precautions in driving.

What you should be:

The list of attitudes and habits which contribute to the success of individuals in any vocation was given on page 191 in the May, 1931, issue of this MAGAZINE, and need not be repeated here.

CONSTRUCTION OF A CIRCUIT PRACTICE BOARD

E. H. Fray, Denfield High School, Duluth, Minnesota

The drawing which accompanies this article shows a new adaption of an old method of teaching circuits to students of electricity. Compared with the practice boards usually found in the elementary shops, this board has several features which are worthy of note. By using the lower voltage and miniature equipment the cost has been considerably reduced and the element of danger which is present when 110 volts is used has been completely eliminated. It might also be mentioned that the building of such a board offers to the student a project in assembly which covers a large number of operations of the type desired, and also brings him in contact with the manipulation of switches of the three-way and four-way types in a manner which promotes a clearer understanding of their operation. The adoption of the lower voltage and the simplicity of operation of the board, brings the work of practicing circuits into the category of an educational pastime which might be carried into the home, and shared by the parent to the mutual advantage of both the boy and the parent. The detailed drawing may be considered merely as a suggestion, as the arrangement of the appliances and the type of materials used could be varied to satisfy the ideas of the builder.

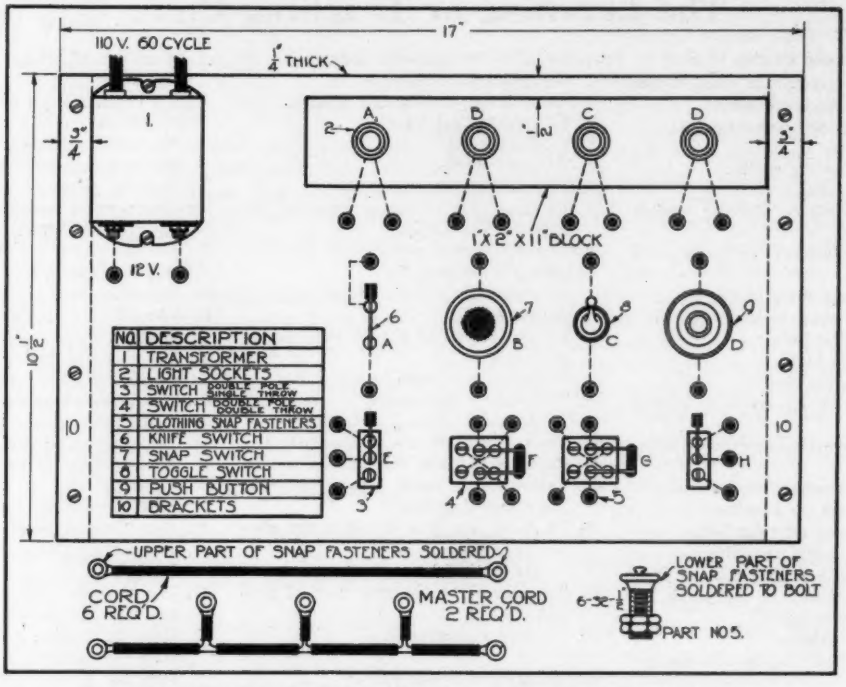
The possibilities of the board, with regard to the circuits demonstrated, are limited to those usually found in practice. Many others could easily be accommodated with the installation of more equipment. The following list of jobs are mentioned as a suggestion:

1. Control light at A from *a*. (Simple circuit)
2. Control lights at A, B, C, and D from *a*. (Lights in parallel)
3. Control light at A from *a*, B from *b*, C from *c*, and D from *d*. (Lights controlled separately)
4. Control lights at A and B from *a*, and those at C and D from *b*. (Groups controlled)
5. Control lights at A and B in series from *a*. (Lights in series)
6. Control lights at A, B, and C in series from *b*. (Lights in series)
7. Control lights at A, B, C, and D in series from *c*. (Lights in series)
8. Control lights at A, B, C, and D from *e* and *h*. (Lights controlled from two points)
9. Control lights at A, B, C, and D from *e*, *f*, and *h*. (Lights controlled from three points)
10. Control lights at A, B, C, and D from *e*, *f*, *g*, and *h*. (Lights controlled from four points)

Construction Details

Although the diagram shows much of the information required to build the board, there are several points which

might be discussed to advantage. The appliances are mounted on a pine board ¼ in. thick. In order to accommodate Christmas-tree sockets of the weatherproof type, it is necessary to install the wooden block shown in the diagram. This block would not be necessary if standard miniature cleat receptacles used for the same purpose. The single-pole double-throw knife switches may be used as three-way switches provided that one side of the switch is always closed. Various types of single-pole switches have been chosen to demonstrate the different methods used to break a circuit. Two master cords are pro-



CIRCUIT PRACTICE BOARD, DESIGNED BY E. H. FRAY, DULUTH, MINNESOTA

were used. Four-way switches are constructed by making reversing switches out of double-pole double-throw knife switches. A reversing switch and a four-way switch may be vided with five snaps to eliminate unnecessary cords and terminals. The remaining cords — six in number — are constructed with a snap on each end. The transformer is a standard 12-volt bell-ringing transformer and the lamps used are 15-volt Christmas-tree lamps. The lower half of the clothing snap must be soldered to the top of a 6—32 machine screw for the purpose of installation and the top half must be soldered to the cords as described in the drawing. In both cases these operations call for considerable care, as the solder must not be permitted to enter the springs of the snaps.

SEWING CABINET, DESIGNED BY G. H. SILVIUS, DETROIT, MICHIGAN

SEWING CABINET

G. H. Silvius, Detroit, Michigan

(See Supplement No. 221)

The accompanying illustrations show a sewing cabinet that creates a great deal of interest because of its simple construction.

It is built of gum, walnut, or mahogany. The sides are mortised into the ends, the gains being cut with a sharp knife against a steel straightedge that is clamped on the stock.

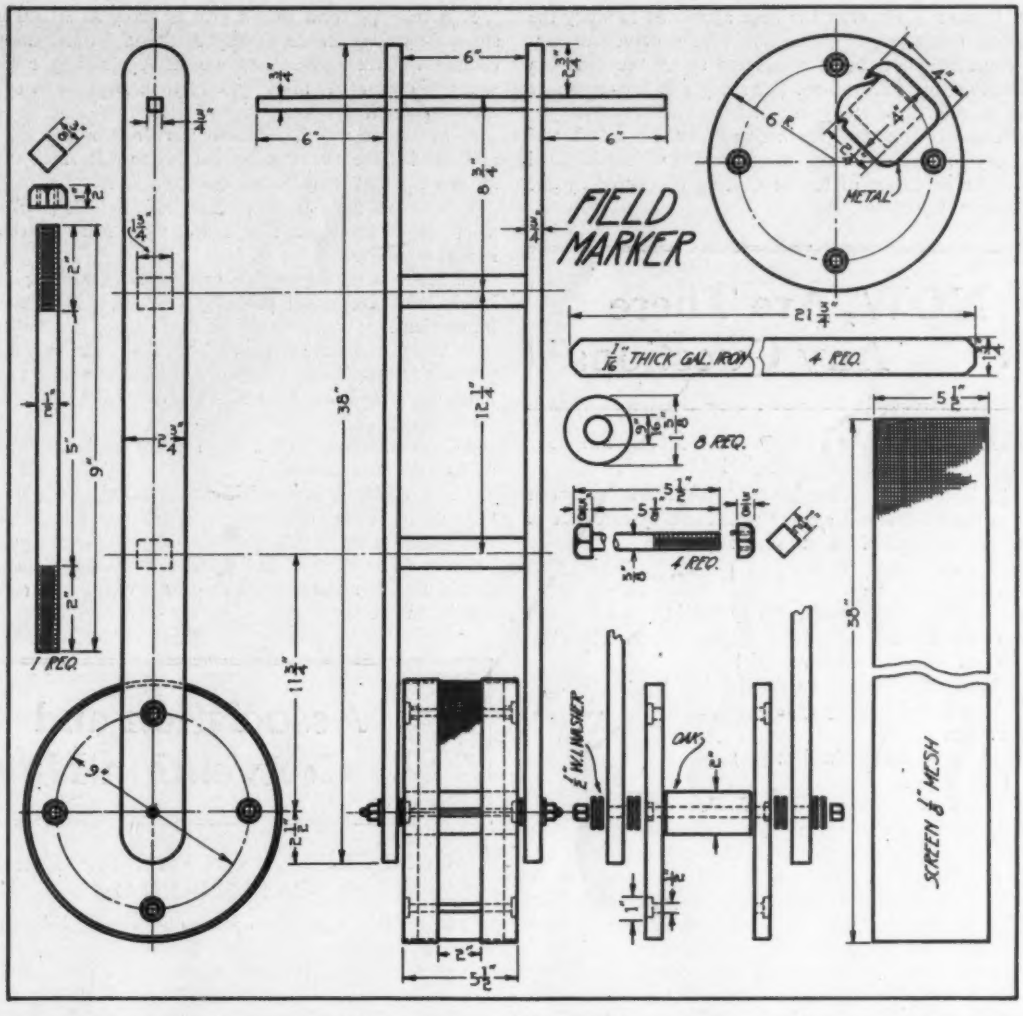
The carving and paneling on the ends and sides are done with the point of a knife. A steel straightedge will be found a decided aid in paneling. The carving is very simple and requires no experience.

Four small, round, wood carvings may be glued on the ends, giving the effect that the turned handle and stretcher extend through the outside of the panels. The feet, the center of the stretcher, and the handle are enameled with black enamel. The lids are high lighted. The sewing cabinet is finished in the natural wood. The enamel is applied before the varnishing is done.

THE LINE MARKER

Henry H. Batchelder, Point Loma High School, San Diego, California

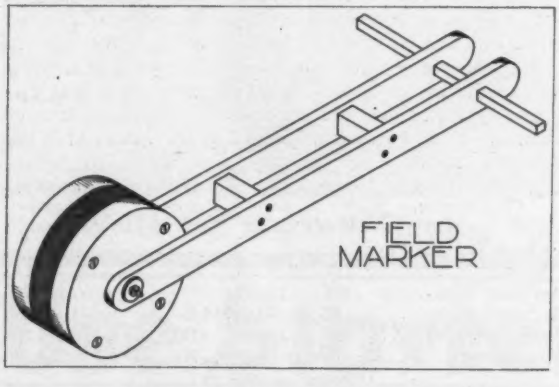
For a novel and useful project for woodwork or general-



shop students, the line marker described and illustrated herewith offers a variety of operations.

This large dry lime or chalk holder is a boon to the physical-education departments. It costs very little, holds a large quantity of the marking material, is easy to fill, and runs very steadily over the ground.

This student project offers good opportunity for varied structural activities, and being constructed of metal and wood, is an exceptional article for a general-shop student. Junior- or senior-high-school classes could construct these markers for the surrounding schools in the same system.



Among the Industrial-Arts Teachers

¶ Mr. Joseph Judson Rogers, 73, an art instructor in the Shaw High School, Cleveland, Ohio, died in a hospital on July 23, following an attack of heart disease. Mr. Rogers was educated in the Akron schools and had been head of the art department of the Shaw High School for a number of years.

¶ Mr. Edgar B. Hammond has been reëlected as president of the board of trustees of the Vocational School at New Bedford, Mass.

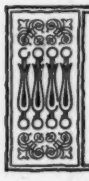
¶ Mr. Charles Zangeline has been appointed as instructor in mechanical drawing in the Blume High School, Wapakoneta, Ohio.

¶ Mr. W. A. Michael has been elected as superintendent of the Glenwood Manual Training School at Glenwood, Ill.

¶ Mr. P. G. Frasier has been elected director of vocational education at Burlington, Iowa, to succeed the late R. H. Barnes.

¶ Mr. Robert S. Hilpert has been appointed to study the trend of art education, in connection with a survey of secondary education, now being conducted under the direction of the U. S. Office of Education. The study will pay particular attention to courses of study in art.

¶ Mr. Leon L. Winslow has been appointed a member of the advisory committee on art, in connection with a national survey of the education of teachers, being conducted by the U. S. Office of Education.



NOW, Are There Any Questions?

WEARING QUALITIES OF PRINTING MATERIALS

948. Q.: Would you please let me know the approximate number of impressions one can get with ordinary care, out of the following printing plates or forms:

1. A zinc etching
2. A copper halftone
3. A copper electrotype of ordinary weight
4. A nickel electrotype
5. A form set of linotype material
6. A form set of monotype metal
7. A form set of foundry type
8. Linoleum blocks
9. Wood cuts (end-grained maple)
10. Aluminotypes
11. Stereotypes —*L. B.*

A.: Answers to the questions above cannot be given accurately, because no scientific experiment can be carried on to determine with any degree of accuracy the ultimate wearing qualities of the various types of relief printing plates and materials. Among the factors which enter into the problem are the original quality of the plates or type, the care which is given in printing, and the printer's own personal judgment of the point at which a plate or type may be considered as worn out. Type metal and various kinds of plates vary considerably in quality. The skill of some pressmen is far above that of others, and they are able to get much better results by careful make-ready than are others. Again, one printer will consider a plate worn out and will discard it about the time when another printer will consider it only slightly worn and will continue to use it for thousands of further impressions. The standards of a printing firm like the Merrymount Press and those of a country newspaper office are quite different, as any printer well understands.

1. Good zinc etchings should print from 150,000 to 200,000 good impressions, depending upon the fineness of the detail lines, dots, etc. The plates are likely to give trouble, however, if they are not very carefully mounted.

2. A copper halftone of 133-line screen used for printing on good enamel stock will give from 150,000 to 200,000 impressions and probably will show comparatively little wear up to 300,000 impressions. It will not last nearly so long if it is printed on dull-coated enamel stock which has abrasive qualities, nor will it last so long if the impression slurs ever so slightly.

3. A copper electrotype should give as many as 200,000 impressions, but it is generally considered that it should give from 75,000 to 100,000 perfect impressions. It is especially necessary that copper electrotypes be mounted carefully. They will last longer on patent base.

4. A nickel electrotype should give about 150,000 perfect impressions. It can be run up to as high as 400,000 impressions before it is worn out.

5. A linotype form should give as many as 50,000 impressions, depending on the quality of the metal and the perfect condition of the slugs. Fine six-point type and type with fine serifs will wear out more quickly than large faces of rather bold character.

6. Monotype metal is slightly harder than linotype metal, and should give 60,000 good impressions. If small type like six point is used, it will wear more quickly.

7. Foundry type should give at least 100,000 good impressions. Here again small type will wear more quickly than larger, bold faces.

8. There is no dependable experience concerning linoleum blocks. Most blocks will probably wear out in less than 10,000 impressions.

9. Wood cuts have a longer life than linoleum blocks, but practically no printer of experience will be willing to print a long run from wood cuts. He will insist that they be electrotyped.

10. Aluminotypes have a long life and can be given as many as 500,000 impressions.

11. Stereotypes have a life approximately as long as linotype metal. They are commonly used only for coarse work, but should give 50,000 impressions. The usual practice of printers who are doing fine work is to change plates after a 50,000 run. For cheap work or coarse work, longer runs are usually made.

Association and Convention News

CONFERENCE ON PRINTING EDUCATION HELD

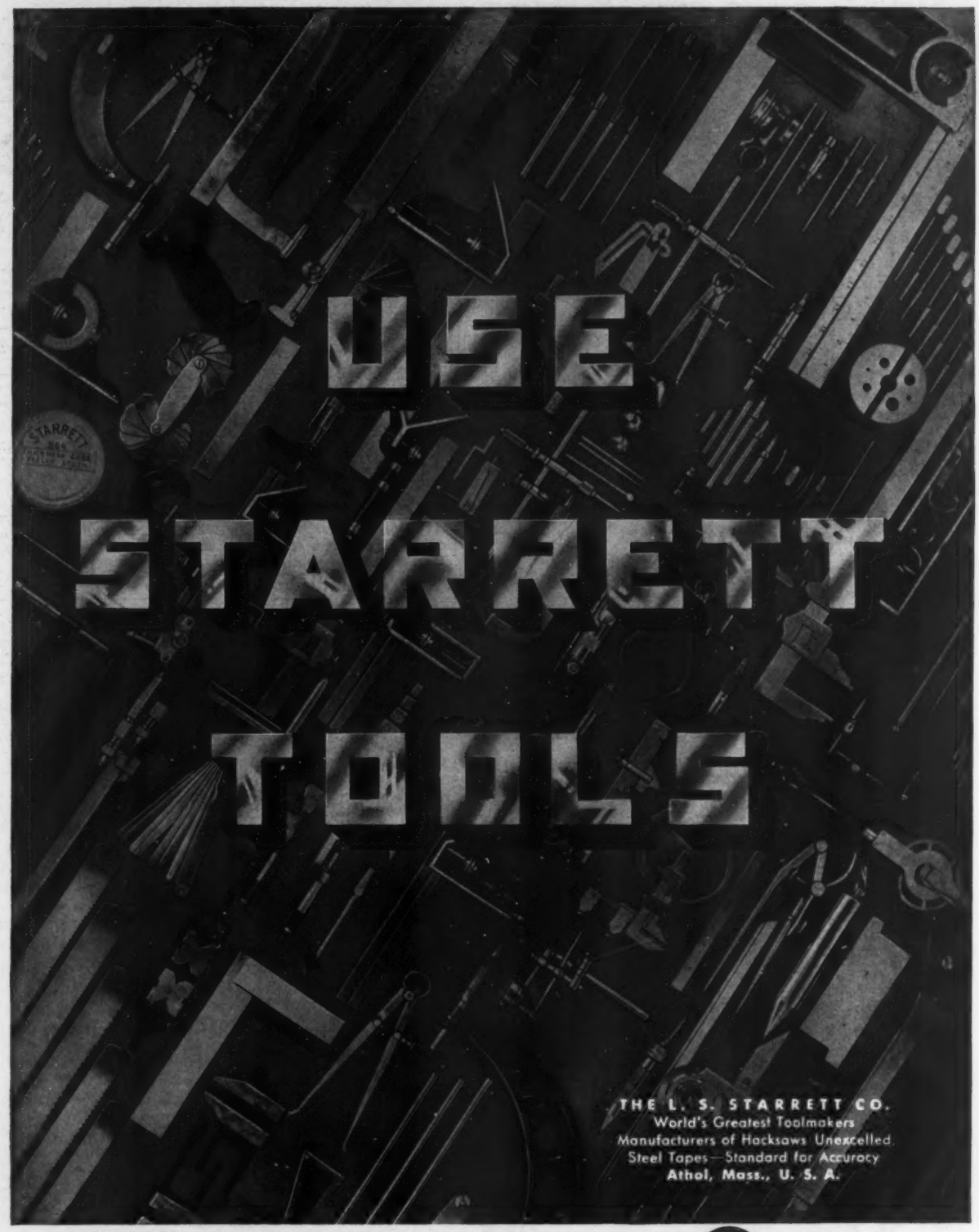
The tenth annual Conference on Printing Education was held at New York University, New York City, June 22–25. It was attended by 196 printing teachers, supervisors of vocational education, and practical printers. Eighteen states, the District of Columbia, and Canada were represented. The keynote of the convention was "Closer Coöperation Between Education and Industry," and more than 40 speakers were on the program. One feature of the Conference was a series of inspection trips to various plants and institutions of interest to printers.

Prior to the Conference three educational surveys had been started and the results of these were discussed as a part of the program. The first of these surveys was on the Courses of Study. This was made by Ralph A. Loomis, Dickinson High School, Jersey City, N. J. Sixty-six departments of printing from widely separated schools of the country sent in material for this survey which will be continued for another year.

The second survey was on the physical facilities of printing education. The returns to the questionnaires sent out in making this study were summarized by the printing students of Carnegie Institute of Technology and the report was submitted by Prof. David Gustafson, head of the Department of Printing of that institution. Its findings are contained in the following table:

Classification	*No. Schools*	*Enrollment*	*Teachers*	*Value of Equipment*
Colleges and Universities	27	1,114	72	$ 773,250
Academic High	185	15,279	221	1,248,700
Technical High	47	5,167	126	1,115,000
Junior High	158	24,048	157	512,200
Elementary	76	5,686	74	114,200

(Continued on Page 19a)



Write for Starrett Catalog No. 25CE :

Use Starrett Hacksaws

5008

HERE is a new bit Extension that has no jaws. It holds bit in socket. No loosening and pulling out of bit in work. Can't jam. Fits any brace. Follows through and stands up.

"Yankee" Bit Extension

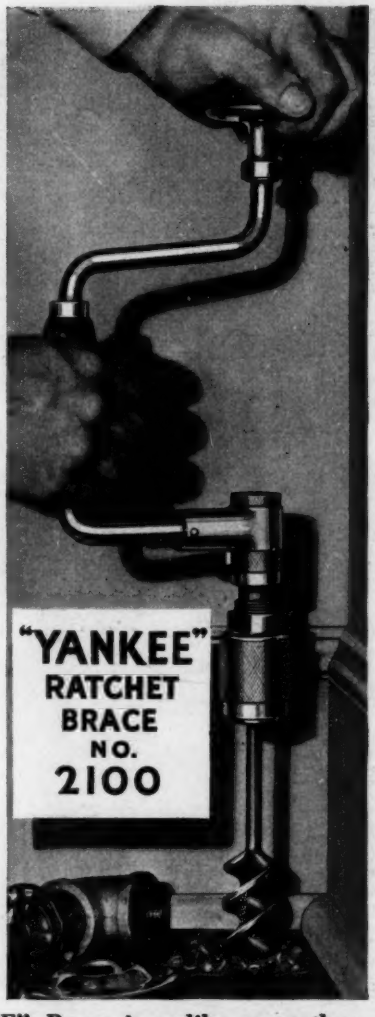
No. 2150. — Made to follow 11/16-inch bit.

No. 2151. — Follows ⅝-inch bit or larger.

Four Sizes: 15", 18", 21", 24", $2.25 up, depending on size.

"Yankee" Brace No. 2100

Four sizes: 8, 10, 12, 14 inches. Two-jaw chuck; ⅜" round; ⅝" square (across corners). Price, 10" sweep, $8.20.



THE "YANKEE" Brace is unlike any other brace. It is bought by those who want precision and finish in toolmaking, and know the economy of paying a little more for quality and efficiency.

The famous "Yankee" Ratchet is smooth, silent, powerful. Bronze encased against dust and moisture. Trouble-proof!

Ratchet adjustment is instant, positive, and visible.

No need to hold chuck to keep from turning back. "Yankee" Chuck centers bits accurately; locks and releases instantly. Holds any shape—round, square, any taper; and will not loosen in work.

"Yankee" Hard-Rubber Handles (both top and side) do not warp, crack, shrink or bind.

Chromium Plating over nickel now added to "Yankee" Tools, at no advance in price. Always like new!

"YANKEE" TOOLS

MAKE BETTER MECHANICS

NORTH BROS. MFG. CO., PHILADELPHIA, U.S.A.

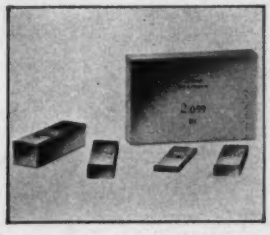
You may send "Yankee" Tool Book (offered in Industrial Arts)—showing Spiral and Ratchet Screw-drivers, Automatic Push Drills, Ratchet Braces, Socket Bit-Extensions, Ratchet and Plain Breast and Hand Drills, Automatic Chain and Bench Drills, Ratchet Tap Wrenches, Continuous-Work Swivel Vises, Plain Screw-drivers, etc.

(Please clip and write name and address in margin below)

Johansson

Gage Blocks and Accessories

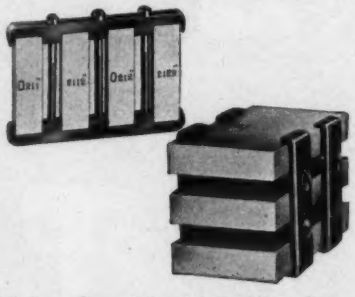
are indispensable to the manufacture of production and inspection tools and gages



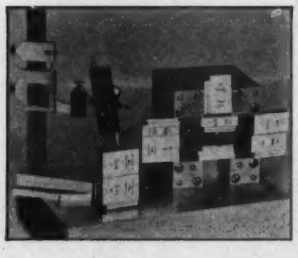
EXPERIENCE over a period of years has proved that there is no method of measuring dimensions of length as reliable or practical as Johansson Gage Blocks and Accessories. They certify the sizes of inspection and production gages and tools quickly and accurately.

Every specified dimension of length on the tools and gages used to manufacture your products can be measured with Johansson Gage Blocks and Accessories.

If a combination of gage blocks is not the most practical, we suggest a special Johansson Gage Block that is the exact size required.



The special gage blocks can be used as single units or can be combined in units of two or more, as illustrated. This gives the machine operator an accurate method of checking and ascertaining the exact condition of his production gages which is reflected in the quality of the parts produced. The parts will, at all times, be within the limits specified by the engineering department and troublesome delays on the assembly line will be eliminated.



Johansson Gage Blocks give the same result any number of times, in the hands of any number of mechanics. There is a Johansson gaging system for every requirement. Send maximum and minimum dimensions of length with closest working limit. We will recommend a gaging system to meet your particular gaging problems. Made in three accuracies. Prompt delivery.

Prices and literature on application — order direct or through your mill supply dealer

C. E. JOHANSSON, *Inc., Division of*

FORD MOTOR COMPANY

Detroit, Michigan

(Continued from Page 346)

Trade and Vocational	38	2,140	139		1,421,150
Continuation	18	3,199	50		221,625
Part-Time	10	1,137	34		423,500
Evening	4	416	7		25,500
Deaf	14	355	22		207,500
Charitable	9	326	19		124,500
Government Indian	2	75	3		10,000
Penal	7	401	12		180,250
Plant	8	1,327	28	(plus foremen)	241,500
	603	60,670	964		$6,618,875

The third survey disclosed the fact that the 224 schools of printing answering the questionnaire had graduated a total of 9,239 students. Of this number, 2,111 have already found employment in the industry, 1,114 are planning to enter it, and 1,094 are going to enter institutions of higher education.

The next Conference will again be held at New York University. Officers for the coming year are:

General chairman, Fred J. Hartman, director of education, United Typothetae of America; eastern section, J. Henry Holloway, principal, Central Printing Trades Continuation School, New York; southern section, E. G. Ingraham, Kingsport Press, Kingsport, Tenn.; northern section, Pearl E. Oldt, Central High School, Grand Rapids, Mich.; western section, Herbert Warfel, Joliet Township High School, Joliet, Ill.; and Canada, Frank Rhodes, Montreal Technical School, Montreal, Canada. — *Fred J. Hartman.*

ALABAMA INDUSTRIAL-ARTS TEACHERS MEET

The industrial-arts teachers of Alabama, at their recent meeting, received and discussed a report of their research committee. The committee, which was enlarged by two members at this meeting, was asked to continue its research work in the industrial-arts field. Each member of the committee conducted an independent study, the fields covered including industry, credit courses in industrial arts, vocational guidance, home mechanics for Alabama schools, and industrial-arts shop equipment. The committee, realizing that it has made only a beginning, recommended that the work should be carried on each year and the results made available to members of this section of the Alabama Education Association.

This year's report showed some marked industrial changes, both in wages and in the number of establishments. The study also took up the subjects of home mechanics, woodwork, automobiles, electricity, plumbing, sheet metal, concrete, printing, together with suggestions for credit courses in industrial-arts work. The report on vocational guidance by E. H. Walker of Dothan, aimed to make industrial-arts teachers more interested in vocational guidance.

At the meeting the following officers were elected to serve for the ensuing year:

President, Mr. Dan T. Jones, Auburn; vice-president, Mr. H. L. Weatherby, Montgomery; secretary, Mr. T. H. Heath, Montgomery; and treasurer, Mr. A. H. Wilshire, Birmingham.

The following were elected to serve as members of the research committee:

D. T. Jones, chairman, Auburn; H. L. Weatherby, Montgomery; V. J. Douglas, Birmingham; V. P. McKinley, Tuscaloosa; R. L. Smitz, Tuscaloosa; E. H. Walker, Dothan; and W. H. Coppedge, Auburn. — *Dan T. Jones.*

THE SCHOOLMEN'S WEEK AT MINNESOTA UNIVERSITY

The annual schoolmen's week was held at the College of Education Building, of the University of Minnesota, with Mr. R. A. Wigen, of South St. Paul, presiding.

At the meeting, Mr. R. T. Craigo, of Dunwoody Institute,

(Continued on Page 22a)

Handbook for DRILLERS
Is This Book a Textbook in Your School?
JUDGING from the large number of requests received, we assume that most of the industrial schools of the country are using the "Handbook for Drillers" to teach the fundamentals of twist drills and drilling practice.
But, we don't want to miss any if we can help it. So, if you've overlooked the "Handbook" up to now, please bear in mind that we're anxious to send you a copy for study, and, thereafter, as many additional copies as you may need to supply your classes.
A brand new "Thirteenth" Edition awaits your order.
The CLEVELAND TWIST DRILL COMPANY CLEVELAND
NEW YORK-CHICAGO-LONDON SAN FRANCISCO

For better craftsmanship

Douglas Fir Plywood gives you all the structural advantages of fine cabinet wood — at less cost per surface foot than ordinary lumber.

(See coupon for free Plywood Plans)

BETTER workmanship in projects—and less cost for materials! These are the outstanding advantages Douglas Fir Plywood offers to every student.

No other low-priced lumber can compare with Douglas Fir Plywood for neatness, strength, and ready workability. It saws easily in any direction, can be planed, sanded, and finished like ordinary lumber, holds nails close to the edge without splitting, and is stronger per pound than steel.

Douglas Fir Plywood is the ideal material for magazine racks, table tops, desks, cabinets, toys, boxes, mirror backs, ping-pong tables, modern furniture, doors, panels, drawers, shelves — in short, for *every* job where wide, true-working boards are needed.

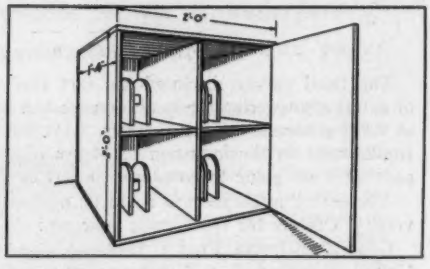
Big Panels of True-working Lumber—in sizes up to 4 feet wide and 8 feet long.

Warp-resisting panels up to 4 feet wide — as thin or as thick as you want them!

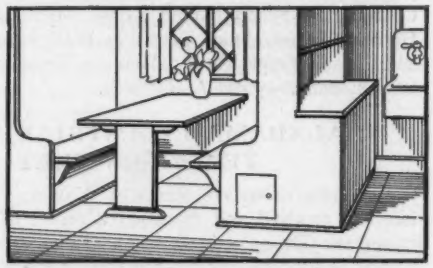
Student projects *look* better and *stay* better with Douglas Fir Plywood — for once in place, this lumber remains everlastingly proof against warping, swelling and shrinking.

You can obtain Douglas Fir Plywood in convenient-size panels up to 4 feet wide and 8 feet long, and in various thicknesses — 3/16", 1/4", 3/8", 1/2", 3/4", or thicker—to suit the needs of any job.

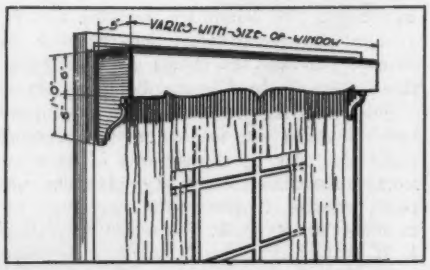
Prices are now the lowest ever quoted. In fact, the thinner panels of genuine Douglas Fir Plywood cost no more than composition wallboards. Ask your local lumber dealer for quotations on various sizes and thicknesses.



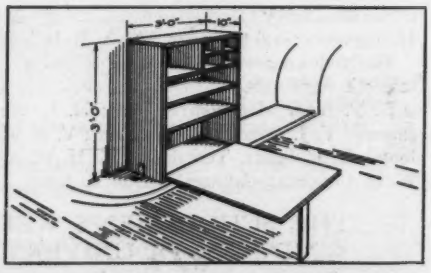
DUST-PROOF HAT BOX: Saves space, keeps hats clean and uncrushed. Easy to build, light and strong—a good project for beginners in manual training.



BREAKFAST NOOK: Can be made at school and assembled at home. An advanced project, but not too difficult. Material costs are low if Douglas Fir Plywood is used.

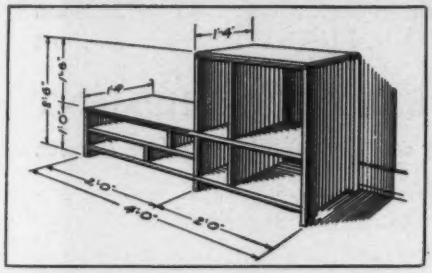


WINDOW VALANCE: Douglas Fir Plywood valances won't warp, and they will last. A good exercise for junior students, and a useful article for many homes.

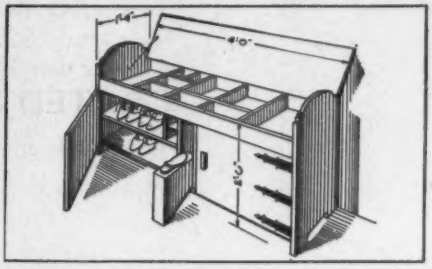


CAMP KIT: High model for auto running board. Lightweight, dust-proof, strong, and a handy table when the front is let down. Easy and economical to make of Plywood—with no danger of splitting.

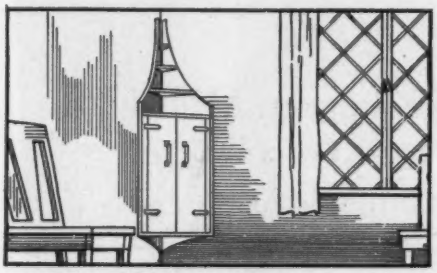
in scores of projects . . . .



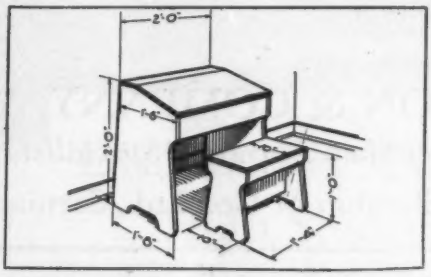
MODERN SIDE TABLE: Ideal for books, magazines, and bric-a-brac. Inexpensive and quickly built with Douglas Fir Plywood—and may be given any wood finish.



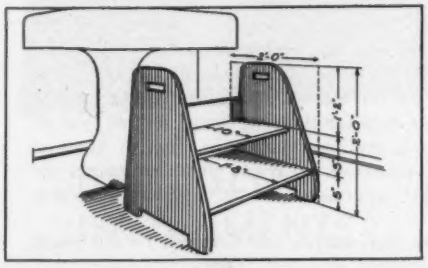
BOUDOIR CHEST AND SEAT: Easy to make of Plywood. Generous space—compactly arranged—for stockings, lingerie, shoes, hats and other articles, and a disappearing foot-rest.



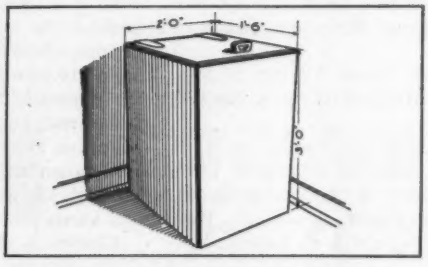
CORNER CUPBOARD: Handy for dining room or sewing room—or for a boy's own bedroom. An attractive and serviceable article, light in weight and low in cost—if made of Plywood.



CHILD'S DESK AND BENCH SET: A sensible project—and a welcome gift for a young brother or sister. Douglas Fir Plywood makes it strong, warp-proof, light and easy to move about, and inexpensive to build.



CHILD'S NON-TIPPABLE STEPLADDER: An interesting and useful project. Can be used by little folks to reach the washstand in comfort and safety, and pushed underneath when not in use.



CLOTHES HAMPER: Not a single surface joint to make, if Plywood is used. Warp-proof, sturdy, easy to move about, and easy for junior students to build.

Supply your stock-room now!

Now is the *best* time to buy. By selecting a full assortment *now* you can make substantial savings on your lumber costs throughout the entire school year.

See your local lumber dealer. If his assortment is incomplete, he will be glad to order for you at current prices.

Remember, the economy of Douglas Fir Plywood enables you to use it for practically *every* manual training job—for benches, basket-ball goal-stops, wardrobes, tool boxes, tie racks, screens, radio cabinets, magazine racks, lamp stands, dressing tables, display racks, card tables, bread boards, and similar articles.

Working plans and perspective drawings of interesting Plywood objects will be sent you free, upon request, while the supply lasts. Mail coupon today.

DOUGLAS FIR PLYWOOD

REAL LUMBER
Engineered for greater size and strength

For Hundreds of Building Uses

Free to instructors!

Douglas Fir Plywood Manufacturers, Dept. 931-L,
Sixth Floor, Skinner Building, Seattle, Wash.

Gentlemen: Please send me a sample of Douglas Fir Plywood, and a copy of your new manual training projects, both free.

Name_____

School_____

Address_____

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CLEARANCE SALE

One of the 98 fundamental Sheldon bench designs for the Woodworking, Sheet-metal, and Home Mechanics Shops.

During the past eight months Sheldon Company have kept their full crew of workmen employed.

This policy has produced an *overstock* of Sheldon high grade SCHOOL FURNITURE of the most popular designs

CRATED READY FOR SHIPMENT

This stock going at COST PRICES while it lasts.

This stock includes:

1068 Manual Training Benches
2177 Art and Drawing Tables
826 Chemistry Tables and Instructors' Desks
391 Physics Tables
336 Biology Tables
1023 Cooking Tables
1709 Commercial Tables
289 Sewing Tables
454 Cases

WRITE OR WIRE FOR SPECIAL PRICES.

E. H. SHELDON & COMPANY, Muskegon, Michigan

School Shop Furniture Specialists for 30 Years

E. H. Sheldon & Co., Ltd., Sarnia, Ont., Canada

(Continued from Page 19a)

Minneapolis, talked on "Job Assignment and Job Checking"; Mr. D. M. Schweickhard, Minneapolis, took up the topic, "Vocational Training in the Secondary Schools"; and Mr. Verne Fryklund, of the University of Minnesota, talked on "Instruction Sheets."

At the business meeting, Mr. W. Bennet Morgan, of Minneapolis, was elected president; Mr. J. R. Fausch, Minneapolis, was elected secretary.

The advisory board for the coming year, consists of H. T. Widdowson, state supervisor of industrial education; Verne Fryklund, University of Minnesota; R. A. Wigen, So. St. Paul, Minn.; A. D. Bailey, Vocational School, St. Paul, Minn.; W. B. Morgan, Minneapolis; and J. R. Fausch, Minneapolis. — *W. B. Morgan.*

New Publications

The Roots of Vocational Education

By William P. Sears. Cloth, 310 pages, 5½ by 8. Published by John Wiley & Sons, New York City.

In this book the author attempts to show how the correlation of economic, social, and educational conditions have influenced the changes and developments in vocational education. The tabulation showing the advance of vocational education from the year 2500 B.C. up to 1930 will be found exceedingly interesting and useful by many who are training to become teachers in vocational education.

Adult Education — The Evening Industrial School

By Charles A. Prosser and M. R. Bass. Cloth, 390 pages, 5½ by 8. Published by The Century Co., New York City.

From a fund of knowledge secured by years of actual experience the authors discuss the important question of the evening school, its organization, administration, and the training of its personnel. Numerous charts show graphically where the responsibility for the different functions of the evening school rest. Definite help for those in charge of this type of education is given in the appendix in the form of hints on registration work, references to charts and chapters in the book giving definite information about instructors' records and lesson plans.

Charles R. Allen has written the foreword to this book.

Vocational Guidance and Success

By Edward J. Gallagher. Cloth, 204 pages, 5½ by 7¾, illustrated. Published by The Bruce Publishing Company, Milwaukee, Wis.

This little book on guidance encourages the student to lay the right kind of foundation in the form of good health, sound education, good character habits, and proper training for a future successful career. It assists him also in making the proper self-analysis and occupational analysis preparatory to definitely choosing a vocation.

Introduction to Art

By Dura Brokaw Cockrell. Cloth, 475 pages, 5½ by 8, illustrated. Published by Richard R. Smith, Inc., New York City.

Anyone interested in art will find in this book a delightful guide through the realms of art, starting from earliest times to present-day modernism.

The arrangement of the material in the book is unique and the subject matter interestingly presented.

DIETZGEN INSTRUMENTS
Help Students Produce Professional Looking Work

Instructor: "Fine work, Fred. It's neat, accurate—actually professional in appearance. You must use good Instruments."

Fred: "Dad says I have the world's best set . . . Dietzgen. When dad gave me the money to buy my outfit he said: 'I'd get a Dietzgen set if I were you. Course I may be prejudiced. I've used my set 15 years at the plant.' Thought dad ought to know so I bought a Dietzgen set. It sure is nice to work with."

Instructor: "You chose one of the best sets on the market, and good instruments are certainly necessary in mechanical drawing."

The instructor who standardizes on Dietzgen instruments helps both student and himself, for good tools are a recognized necessity in mechanical drawing.

WRITE FOR SCHOOL CATALOG NO. 30A

DIETZGEN INSTRUMENTS

- ARE ACCURATE
- ARE DURABLE
- ARE MILLED FROM BARS—NOT STAMPED OUT
- ARE MADE FROM COLD ROLLED NICKEL SILVER
- JOINTS ARE ACCURATELY FITTED
- PARTS ARE INTERCHANGEABLE
- EACH PROCESS OF MANUFACTURE IS CAREFULLY SUPERVISED

EUGENE DIETZGEN CO.

Enduring worth at reasonable cost

Chicago New York Philadelphia Washington
New Orleans Pittsburgh Milwaukee Los Angeles
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DIETZGEN

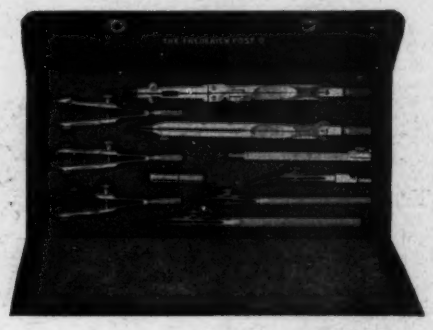
Manufacturers of Drafting and Surveying Supplies

STANDARDIZE ON DIETZGEN STANDARDIZED INSTRUMENTS

For the Instructor's Selection —

39

POST DRAWING INSTRUMENT SETS



This set and 38 others of all styles and at moderate prices are illustrated and described in the new School Supply pamphlet. It also contains suggested materials and prices on all supplies used in the School Drafting Room.

Special Discounts to Schools.

For the School Supply pamphlet just write

THE FREDERICK POST COMPANY

P. O. BOX 803 CHICAGO

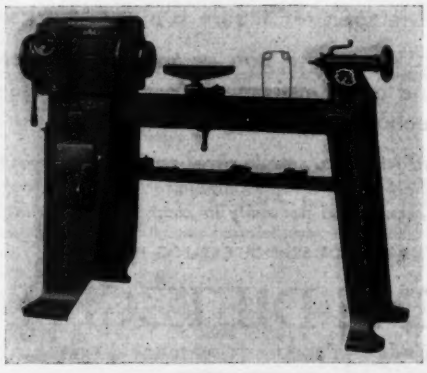
Hughes Owens Co., Ltd., *Canadian Distributors.*

SCHOOL SHOP EQUIPMENT NEWS

For the Supervisor or Teacher who desires to keep abreast with news of new Machinery, Tools, Supplies, etc.

FAY-EGAN NO. 400 MOTOR LATHE

The Fay & Egan Company, of Oakley, Cincinnati, Ohio, manufacturers of woodworking machinery, have just placed on the market their new No. 400 motor lathe.



The lathe has a dustproof headstock of compact, well-balanced design, single unit, which houses the motor, spindle, ball bearings, control, brake, and wiring. It is provided with a foolproof four-speed control, operated by means of a hand-wheel which is easily accessible to the operator. The control is so interlocked that the motor must be started on a speed of 600 r.p.m., and stepped up to 1200, 1800, or 3600. It has a combination reset and stop push-button control, providing both overload and low-voltage protection. All levers are of the attached wrench type. The lathe has a new fork type of holder for center ramrod, and a positive-contracting grip ring for the rear faceplate to prevent loosening.

Complete information and prices may be obtained by any shop instructor upon request.

A NEW SAW-BENCH CHART

The Oliver Machinery Company of Grand Rapids, Mich., has just developed a new chart showing a saw bench with the different parts named. This chart is suitable for wall mounting or framing and any woodworking-shop instructor may obtain one gratis for use in his shop.

ISSUE BOOKLET ON GRINDING-WHEEL SELECTION

The Norton Company, of Worcester, Mass., has issued a fifteen-page booklet entitled, "Factors Affecting Grinding-Wheel Selection," telling how to select the best grinding wheel for any operation. It gives the five characteristics for determining the grinding action of Norton wheels and offers typical examples of grinding-wheel markings.

A copy of the booklet will be sent to any school-shop instructor upon request.

The American School Galley Cabinet

(In steel) No. 13535 (In wood) No. 3535
with Working Top and Doors with Locks

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The American School Galley Cabinet fills a long-felt want in school printshops. It was designed to meet the expressed wishes of printing teachers who are required to handle several classes daily.

The American School Galley Cabinet holds one hundred 8¾x13 galleys. It contains four tiers, each tier holding twenty-five galleys, with partitions numbered from 1 to 25. Each tier is provided with a door, fitted with an excellent lock. One key fits the locks on all four doors in each cabinet. The sloping top provides facilities for dumping type and for make-up purposes. If desired, a flat top can be substituted for the sloping top. Floor dimensions, 47⅛ inches long by 17¼ inches deep. Height to working surface in front, 40$^{9}/_{16}$ inches.

The use of the American School Galley Cabinets affords increased facilities for dumping type composition and for make-up.

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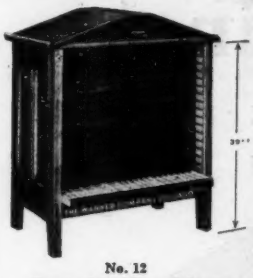

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NEWS NOTES

Introduce Vocational Work

Vocation-training work has been introduced in the Barret High School at Henderson, Ky. An appropriation of $2,000 has been made to cover the expense of the classes.

Introduce Industrial-Arts Work

The school board of the Barnesville Consolidated School District, Wymore, Nebr., has introduced industrial-arts work at the Otoe School.

New Forest Products Laboratory

The new laboratory building to be erected at a cost of $900,000 by the Forest Products Laboratory of the United States Forest Service at Madison, Wis., will occupy the site of several Indian ceremonials and burial grounds. The site for this new building embraces 10 acres of ground.

New Film on Forests

The extension service of the U. S. Department of Agriculture has issued a new film, "How Forests Serve," which shows some of the ways in which protected forests serve by providing work in the woods, in mills, in factories, and in building. The film shows ways in which chestnut may be salvaged, while the closing scene points out the scenic and recreational values.

Motion-Picture Film Shows Uses of Concrete

The numerous uses of concrete are described in a one-reel film entitled, "Construction that Endures," prepared under the supervision of the U. S. Bureau of Mines, in coöperation with an industrial concern. The film shows the composition of concrete, the use of concrete for roads and streets, and other purposes, as well as its use in the making of art objects by artists and others. Copies of the film may be obtained for exhibition purposes by schools and educational institutions by applying to the Pittsburgh Station of the U. S. Bureau of Mines, Pittsburgh, Pa.

Stout Summer Session

The Stout Institute summer session, which opened on June 15, for a nine weeks' period, was attended by 165 women and 365 men. This was the largest total summer-session attendance in the history of the school, the largest attendance of women in the past nine years, and it set a new record for attendance of men students. The students in attendance represented 31 states, Canada, and Hawaii.

The list of speakers and conference leaders included Mr. C. M. Miller, of the Kansas state department of education; Dr. A. H. Edgerton, of the University of Wisconsin; Mr. J. E. Hansen, of the University of Wisconsin; Mr. L. H. Dennis, of the Pennsylvania state department; and Miss Mary Beeman, of the Ball Teachers' College.

Beginning with the year 1932, the summer sessions will be conducted on the six weeks' basis.

More Than a Million Take Vocational Training

The Federal Board for Vocational Education, in its recent annual report, stated that more than a million persons were enrolled in vocational schools last year. This enrollment was largely in schools which received aid under the terms of the Vocational Education Law and in vocational courses organized and conducted under a joint federal and state plan of vocational education.

(Continued on Page 29a)

ADVERTISING PAGES REMOVED

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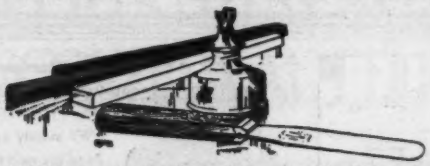

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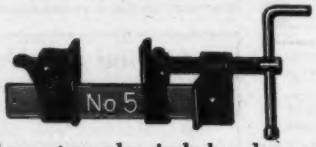

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(Continued from Page 26a)

Latham Traveling Art Exhibit for Schools

The Latham Foundation of Oakland, Calif., has assembled a fine collection of posters for a traveling exhibit. The posters were made by children in the grade and high schools of the country. The exhibit shows the progressive steps in making good posters and are well worthy of the attention of schools and school officials.

The exhibit will be loaned free to any school which will agree to pay the cost of transportation. School officials or teachers who are interested should write to Mr. John T. Lemos, Box 1322, Stanford University, Calif.

Training for Welders

Mr. J. H. Zink and Mr. S. Lewis Land, in a paper on "Training Your Welders," have endeavored to offer some suggestions for a definite and specific training program in welding for journeyman pipe fitters which will be of help to local associations and groups of individual members of the National Association of Heating and Piping Contractors who will want to set up such programs. The paper offers suggestions for the organization of evening classes for journeymen in welding, outlines the minimum standards, lists and describes the necessary welding equipment, and offers the information and data which form the basis for the course of study. The paper was reprinted in the September number of the Official Bulletin of the National Association.

Compulsory Trade-School Law of Wisconsin Approved

The complete retention and strengthening of the Wisconsin law for compulsory attendance of vocational schools has been recommended by the state interim committee on education in its report recently presented. It was pointed out that the state holds a position of world-wide leadership in vocational education. It was stressed that the part-time law aids unemployment by making shorter working hours and shorter weeks for employees and by allowing industry to absorb more of them.

Experiment in Vocational Guidance

The Stevens Institute of Technology, Hoboken, N. J., will conduct an experiment in vocational guidance for boys at its engineering camp in northern New Jersey from August 15 to August 29. During this time the college offers a guidance program on the subject of the engineering profession and its functions. It is the aim of this movement to give boys ready for college entrance an idea of engineering in general, some practical experience of an engineering nature, and guidance in choosing the proper college course to be followed.

Men actively engaged in engineering will be brought to the camp to tell the boys about the electrical, mechanical, civil, chemical, and industrial phases of engineering. They will also discuss the opportunities offered by each of these branches and some of the problems with which an engineer is confronted. The lectures will be supplemented by motion pictures showing actual engineering work in progress. The practical engineering work which the boys will be allowed to sample will be under the supervision of faculty members of the Stevens Institute of Technology.

Special individual aptitude tests will be given each boy under the direction of Mr. W. V. Bingham, Mr. Johnson O'Connor, and Mr. A. L. Jones, of Columbia University, in order to aid the boys in making their decision. It is hoped that the results obtained through this experiment, while not infallible, will be sufficiently accurate to materially aid in making the right choice between engineering and academic college training.

New Industrial-Arts Building

Construction work has started on the industrial-arts building for the State Normal School at Oswego, N. Y. The contracts for the work were awarded in April and the building will be completed within a year, at a cost of approximately $300,000.

The School Shop Shopping Guide

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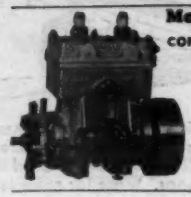

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